



WETLAND TECHNICAL REPORT

LUTSEN MOUNTAINS RESORT SE GROUP

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1 INTRODUCTION

Lutsen Mountains Corporation (LMC) has applied to the United States (U.S.) Forest Service (Forest Service) for a Special Use Permit (SUP) that would authorize LMC to construct, operate, and maintain an expansion of the Lutsen Mountains Resort (Lutsen Mountains) onto approximately 495 acres of National Forest Systems (NFS) land and onto adjacent private lands. The purpose of the proposed projects is to improve the guest experience at Lutsen Mountains. Specifically, LMC has identified a need to:

- Construct additional traditionally cleared alpine ski trails and undeveloped, minimally maintained lift-served terrain to address the current deficit in beginner and expert terrain and to enhance the existing terrain variety and skiing experiences at Lutsen Mountains.
- Improve skier circulation and reliable snow conditions, particularly on Eagle Mountain and Moose Mountain.
- Improve base area, parking, guest services, and operational facilities to meet the ever-increasing expectations of the local, regional, and destination skier markets.

The Forest Service has determined an Environmental Impact Statement (EIS) will be necessary to review, analyze, and document the effects to the human, physical, and biological environment anticipated to result from the issuance of a SUP. The purpose of this Wetland Technical Report is to analyze the likely effects of the proposed LMC projects to waters of the U.S., including wetlands.

2 SCOPE OF THE ANALYSIS

2.1 ANALYSIS AREA

The Analysis Area is the specific boundary evaluated for direct, indirect and cumulative effects. The Analysis Area for this Wetland Technical Report includes the proposed Lutsen Mountains SUP area under both the Proposed Action and Alternative 3 located on NFS lands and all projects on private lands. The projects located on private lands are analyzed in this report as “connected actions”. The Analysis Area is located near the unincorporated community of Lutsen, Minnesota in Sections 21, 28, 29, 30, 31, and 32 of Township 60 North, Range 03 West in Cook County (**Figure 1**).

Wetlands form under specific conditions based on a region’s physiography and climate. The physiography of the Analysis Area is similar for both Moose Mountain and Eagle Mountain. The topography is dominated by the Leveaux ferrodiorite Precambrian bedrock in the higher elevations where the bedrock is commonly exposed. The lower elevations in the southern portions on the Analysis Area are underlain by Good Harbor bay andesites. The Quaternary geology consists of non-calcareous till ground moraine (Superior Lobe-Mill Lacs-Highland). Detailed soil descriptions for the Analysis Area are provided in the Soils Technical Report for the Lutsen Mountains Ski Area Expansion Project (SE Group, 2020a). Elevations of Moose Mountain range from 1,690 feet above mean sea level (AMSL) near the summit to 850 feet AMSL along the southern portion of the SUP. The vertical relief of Eagle Mountain ranges from 1,651 feet AMSL near the summit to 1,090 feet AMSL along the southern portion of the SUP.

The Analysis Area is within two different 6th level watersheds (6th level watersheds are also referred to by their 12-digit Hydrologic Unit Code, or HUC12): the City of Tofte-Frontal Lake Superior watershed (HUC12 040101011302) and the City of Lutsen-Frontal Lake Superior watershed (HUC12 040101011301). Two minor project components are located within the Poplar River watershed (HUC12 040101010705) but are considered negligible and do not warrant inclusion of the Poplar River watershed in the analysis area. None of the project watersheds are within the Boundary Waters Canoe Area Wilderness. The Hydrology Report completed for this project delineated three sub-watersheds at the project scale referred to as the study watersheds. The study watersheds include: (1) Moose Mtn-Frontal Lake Superior; (2) Eagle Mtn-Frontal Lake Superior; and (3) Upper Rollins Creek. A detailed description of the Analysis Area watersheds is provided in the Lutsen Mountains Ski Area Expansion Project Hydrology Report (LRE Water, 2020). Mean annual precipitation for the area is 23 to 24 inches. The effects of climate change on precipitation are provided in the Air Quality and Climate Change Technical Report (SE Group, 2020b). Landcover of the Analysis Area consists of six native plant community classes based on the Minnesota Department of Natural Resources (DNR) Native Plant Community classification: Mesic Mafic Cliff (Northern) (CTn32a), Aspen – Birch Forest (FDn43b), Upland White Cedar Forest (FDn43c), Paper Birch – Sugar Maple Forest (MHn45a), Sugar Maple Forest (North Shore) (MHn45c), and Lowland White Cedar Forest (North Shore) (WFn53a) (MNR 2020). Most of the wetlands within the Analysis Area are formed from seeps and springs or along slope breaks where groundwater discharges to the land surface or precipitation accumulates at the base of slopes.

2.2 WATERS OF THE U.S.

The scope of this Wetland Technical Report is to analyze the likely effects of the proposed LMC projects to waters of the U.S., including wetlands. The Analysis Area was specifically surveyed for wetlands, (as defined under Section 404 of the Clean Water Act, calcareous fens, seasonal ponds, seeps, springs, and streams (intermittent, ephemeral, and perennial), collectively referred to as *wetland resources* within this report. Rivers and lakes are not present within the Analysis Area. The U.S. Army Corps of Engineers (USACE) determines jurisdictional waters of the U.S. through a process known as a jurisdictional determination. Only USACE personnel can complete a jurisdictional determination. Since a jurisdictional determination has not been completed for the Analysis Area, all wetland resources are considered to be waters of the U.S. for the purposes of this report. This report assumes all wetlands protected by the Minnesota Wetland Conservation Act are also waters of the U.S. A detailed discussion of the waters of the U.S. observations and methodology is included in section 4.0.

3 DESCRIPTION OF ALTERNATIVES

The section summarizes the project alternatives. For a full description of the project alternatives, please refer to the EIS associated with this project.

3.1 ALTERNATIVE 1 – NO ACTION

The No Action Alternative provides a baseline for comparing the effects of the action alternatives. The No Action Alternative essentially reflects a continuation of existing management practices without changes, additions, or upgrades. The SUP permit application for LMC would not be approved and no additional lifts, ski trails, or recreation opportunities would be constructed on NFS lands under the No Action Alternative.

3.2 ALTERNATIVE 2 – PROPOSED ACTION

The projects included in the Proposed Action are designed to enhance the winter recreation experience for guests to Lutsen Mountains and the SNF in a manner that is consistent with the Forest Service direction of providing natural resource-based recreation. The proposal contains individual projects located in the Moose Mountain and Eagle Mountain areas of the SNF and on private lands. Specifics on which projects are located on SNF or private lands are provided in the associated EIS for this project. A figure of the Proposed Action projects is included in **Appendix A, Figure 1: Proposed Action**.

The Proposed Action includes the following elements:

- Authorization of a SUP;
 - Construction of seven new chairlifts and one surface lift;
 - Development of 324 acres of additional ski terrain, including 175 acres of developed ski trails and 149 acres of gladed terrain;
 - Expansion of guest services including two new base facilities, maintenance facilities, a mountain-top chalet, and all associated infrastructure;
 - Expansion of ski patrol operations, including construction of an interim ski patrol duty station located in a similar location to the mountain-top chalet;
 - Development of approximately 1,260 additional parking spaces (630 at Moose Mountain and 630 at Eagle Mountain), construction of approximately 5 miles of permanent access roads, and construction of approximately 0.9 miles of temporary access roads; and
 - Installation of snowmaking coverage on all 175 acres of developed ski trails and construction of 2 snowmaking reservoirs with a combined capacity of 13 million gallons.
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3.2.1 PROPOSED SPECIAL USE PERMIT

The development of the proposed lifts, terrain, and guest services at Lutsen Mountains would require the authorization of an approximately 495-acre SUP on NFS lands. This SUP would be divided into two noncontiguous areas: a 459-acre portion on the southwest part of Moose Mountain and southwest of the existing LMC Moose Mountain terrain (3.25% of the City of Tofte-Frontal Lake Superior watershed), and a 36-acre area

on the south side of Eagle Mountain and directly south of LMC's existing Eagle Mountain terrain (0.22% of the City of Lutsen-Frontal Lake Superior watershed).

3.2.2 CHAIRLIFTS

The proposal includes seven new chairlifts and one surface lift. Grading and ground disturbance would be required for all chairlift construction. Grading and tree/brush cutting would occur at the top and bottom terminals of all proposed chairlifts; however, the specific area of this grading would be dependent on topographical conditions. Along chairlift alignments, trees and brush would be cut and towers with concrete foundations installed between the bottom and upper terminals at varying intervals based on topography and engineering constraints. The construction area around the tower foundations, where soils would most likely be disturbed, are typically 30 feet by 30 feet in size but would vary based on ground conditions. Towers would be constructed using a track hoe or similar equipment, which would be driven across natural terrain that has been cleared of trees and brush. Construction access roads are typically not created for new chairlift tower installation, which are usually installed via helicopter or use of existing roads but may require temporary access roads.

3.2.3 SKI TERRAIN

Under the Proposed Action, Lutsen Mountains' developed ski terrain network would increase by approximately 174.5 acres, from approximately 187.3 acres to 361.8 acres. Six separate pods of ski terrain are proposed. A variety of gladed terrain, which would be developed in the tree islands in between the proposed develop runs, is also proposed. Glade skiing would increase from approximately 23.5 acres to 172.5 acres. A total of approximately 174.5 acres of traditionally cleared ski terrain would be developed under the Proposed Action. Of the proposed 174.5 acres of traditional terrain, approximately 142 acres would be located on NFS lands and 32.5 acres would be located on private land. In addition, to the proposed ski terrain, approximately 1.4 acres of connector trails are proposed. An additional 0.5-acre emergency egress route from the bottom terminal of Lift 3 to the bottom terminal of Lift 2A is also proposed. This emergency egress route would be utilized if Lift 3 broke down but would otherwise be closed to skiers and is not included in the overall calculation of proposed ski terrain.

3.2.4 SNOWMAKING

Snowmaking infrastructure would be installed on all new developed ski trails, for a total of 174.5 acres of snowmaking coverage. Snowmaking infrastructure necessary to support the proposed snowmaking system would include new pumps, valves, hydrants, pump houses, airlines, waterlines, and powerlines. Snowmaking lines would be located aboveground on the edges of the proposed ski trails and roads; the exact location of these lines would be determined during final design. Each trail would have a snowmaking line along its entire length.

Two snowmaking reservoirs are proposed as part of the Proposed Action connecting with LMC's existing snowmaking line that originates at a pump house on the shore of Lake Superior. Two snowmaking reservoirs would be constructed near the Moose Mountain base area. Both snowmaking reservoirs would be located on NFS lands and would require new water pipelines to connect to both existing and proposed snowmaking pipeline infrastructure. An estimated 6,214 feet of pipeline connecting the proposed snowmaking ponds to the existing snowmaking pipeline is proposed. Approximately 1,417 feet are proposed on NFS lands within the Moose Mountain section of the SUP. Approximately 4,797 feet are proposed on private lands adjacent to Moose Mountain. Where feasible the snowmaking and powerlines would be buried and impacts would be temporary.

Snowmaking lines are buried below the frost line to avoid freezing. A temporary construction access route would be developed along the snowmaking pipeline alignment to provide access to the proposed Moose Mountain snowmaking ponds.

3.2.5 GUEST SERVICES AND OPERATIONS

Two new base areas are proposed: one in the Eagle Mountain area of the SUP and the other in the Moose Mountain area of the SUP. The Eagle Mountain base area is proposed to include skier service facilities like restrooms, food and bar services and seating, ticketing and rental/repair options, ski school opportunities, and public lockers. It would also include operational space like administrative offices, ski patrol space, storage, maintenance facilities, and employee lockers and lounge space. The base area would also include approximately 630 parking spaces. The Moose Mountain base area would include a base lodge containing restrooms, food service and seating, ticketing and rental options, ski school opportunities, administrative offices, maintenance facilities, employee lockers, and other storage. This section of the SUP would also contain approximately 630 parking spaces. To provide additional food service opportunities, the Moose Mountain Chalet is proposed near the top terminals of Lift 2 and Lift 5.

3.2.6 CONSTRUCTION, MAINTENANCE, AND UTILITIES

Existing Snowmobile and Hiking Trail Realignment

Two existing trails would be realigned as part of the Proposed Action. In the proposed Eagle Mountain area of the SUP, approximately 782 feet of an existing snowmobile trail would be realigned south of the proposed Eagle Mountain base area parking area, Lift 1-A, and beginners' area. The realigned portion of the trail would be approximately 1,425 feet long, which is an additional 643 feet of snowmobile trail length. LMC would realign the snowmobile trail in coordination with the Forest Service and Ridge Riders Snowmobile Club.

The second trail that would be realigned is an 8,947-foot-long portion of the Superior Hiking Trail (SHT)/North Country National Scenic Trail (NCNST) within the proposed Moose Mountain area of the SUP. The realignment would add an additional 1,289 feet to the length of the SHT/NCNST. This alignment was developed in coordination with the Superior Hiking Trail Association during pre-planning activities; in addition, LMC would continue to coordinate with the Superior Hiking Trail Association, North Country Trail Association, and the U.S. National Park Service (NPS) prior to and during realignment activities.

Access Roads

Approximately five miles of new permanent access roads and one mile of temporary access roads are proposed under the Proposed Action. The proposed Eagle Mountain and Moose Mountain base areas would require the construction of new permanent roads for access by guests and ski area personnel. For purposes of this analysis, both the Eagle Mountain and Moose Mountain permanent base area roads are assumed to have a maximum disturbance corridor width of 50 feet. The Eagle Mountain base area would require an approximately 2,051-foot-long access road originating from Ski Hill Road and passing through 1,358 feet of private lands before crossing into 693 feet of NFS lands and connecting to the proposed skier arrival area. The proposed Moose Mountain base area would be accessed by an approximately 5,770-foot-long road originating from State Highway (SH) 61 and passing through 3,074 feet of private lands before crossing into 2,696 feet of NFS lands and connecting to the proposed skier arrival area.

New permanent mountain access roads would be required to both the top and bottom terminals of each proposed lift for lift construction and maintenance on Moose Mountain. For purposes of this analysis, all mountain roads are assumed to have a maximum disturbance corridor width of 25 feet, with a 15-foot wide road surface and an additional 10-foot disturbance buffer for cut and fill slopes. Mountain access road details are provided in the associated EIS for this project.

Temporary access roads may be required for the construction and installation of lifts and lift towers. Eight temporary mountain access roads are proposed. Approximately 4,805 feet of these roads would be on NFS lands and approximately 349 feet would be on private land. Following completion of the project, temporary roads would be decommissioned and revegetated.

Utilities

Utilities required for both proposed base areas would include electricity, domestic water, and sewer. For purposes of this analysis it is assumed that utility lines would be buried within proposed access road and ski trail corridors and co-located to minimize disturbance; however, construction of cross-country utilities lines may be required. To provide power to the Moose Mountain base area, an approximately 4,520-foot long section of powerline would be installed from the existing powerlines adjacent to SH 61 to the Moose Mountain base area. Power would be provided to the Eagle Mountain base area through an existing powerline. Septic drain fields are proposed in the Eagle Mountain and Moose Mountain base areas. Each base area drain field would be approximately 1.2 acres in size. The domestic water supply currently consists of a private system of seven groundwater wells located throughout Lutsen Mountains. Two new wells would be constructed on NFS lands under the Proposed Action: one well at the Moose Mountain Chalet and one well at the Moose Mountain base area. Two stormwater ponds are proposed in the Eagle Mountain SUP area and would require approximately 0.62 acres of ground disturbance. Two stormwater ponds are also proposed in the Moose Mountain SUP area and would require approximately 0.74 acres of ground disturbance.

Tree Removal and Grading

As discussed in previous sections, trees would be removed or limbed for trail corridor construction, enhancement, accessibility, or other management needs. The primary method of tree removal is anticipated to be ground-based cut-and-skid type logging. Skidding would occur on existing roads, proposed roads, existing ski trail corridors, or proposed ski trail corridors. Aerial-based logging via helicopter may also be utilized in the Moose Mountain area. In addition to tree removal, a variety of grading would be required for construction of the project components. Grading would involve the use of bulldozers and dump trucks to create level areas for staging areas, lift terminals, the base areas, and roads. In addition, LMC would grade breakovers within proposed traditional ski terrain. Certain components would also require cut-and-fill grading to produce level terrain; plans for cut-and-fill grading would be reviewed by Forest Service personnel prior to implementation.

3.3 ALTERNATIVE 3 – RESOURCE PROTECTION ALTERNATIVE

The projects included in Alternative 3 would be similar to Alternative 2 – Proposed Action while addressing a variety of resource concerns identified by the SNF Interdisciplinary Team as well as by the public through the scoping process. Eagle Mountain project components, Moose Mountain base area (including parking and access road, snowmaking ponds, stormwater ponds, and utilities), Lifts 2 and 3, and the temporary mountain access roads would remain identical to the Proposed Action. The following sections provide a summary of the components of

Alternative 3 that differ from the Proposed Action. A figure of the Alternative 3 projects is included in **Appendix A, Figure 2: Alternative 3.**

3.3.1 PROPOSED SPECIAL USE PERMIT

Alternative 3 would include the authorization of a 478-acre non-contiguous SUP area: a 442-acre SUP area on Moose Mountain (3% of the City of Tofte-Frontal Lake Superior watershed and a 36-acre SUP area on Eagle Mountain (0.2% of the City of Lutsen-Frontal Lake Superior watershed). The Eagle Mountain section of the SUP would be identical to the Proposed Action. The Moose Mountain SUP area would differ from the Proposed Action, removing 110 acres from the northwest side of Moose Mountain and adding approximately 92.9 acres to the southwest side of Moose Mountain.

3.3.2 CHAIRLIFTS

Alternative 3 includes a total of five new chairlifts and one surface lift. Lifts 1, 1-A, 2, 2-A, and 3 would be identical to those described in the Proposed Action. Lifts 4, 5, and 6, located on the northwest side of Moose Mountain, would be removed under Alternative 3. Alternative 3 would include the addition of Lift 7. Lift 7 would provide access to an area further west on Moose Mountain. Construction methodology for lifts under Alternative 3 would be identical to that discussed under the Proposed Action. To provide access to Lift 7 and the modified trail network, mountain access roads would be required. Refer to section 3.3.6 for the discussion of access roads.

3.3.3 SKI TERRAIN

The amount of new developed and glade skiing would be reduced in Alternative 3 compared to the Proposed Action to provide forest legacy patches in an area of habitat concern. Lutsen Mountains' developed ski terrain network (not including access trails) would increase by approximately 167.2 acres, from approximately 187.3 existing acres to 354.5 acres. Glade skiing would increase by 126 acres, from approximately 23.5 existing acres to 149.5 acres.

The amount of new traditionally cleared ski terrain would be reduced from the Proposed Action to approximately 167.2 acres under Alternative 3. Most of the proposed traditionally cleared ski terrain (134.6 acres) is located on Moose Mountain, with approximately 31.4 acres located on Eagle Mountain. The Eagle Mountain terrain proposed in Alternative 3 would be identical to the terrain in the Proposed Action.

In addition to the proposed ski terrain, several connector and access/egress routes are proposed. Connector and access/egress routes are the same as the Proposed Action except for an additional 3,005-foot egress route proposed from the bottom of Lift 7 to the southern Moose Mountain parking lots to provide easier egress to vehicles for guests leaving at the end of the day.

Under Alternative 3, the amount of new gladed terrain would be reduced by approximately 126 acres compared to the Proposed Action. Construction methods for gladed terrain would be identical to the Proposed Action.

3.3.4 SNOWMAKING

Alternative 3 would include snowmaking on all proposed developed terrain, resulting in approximately 167.2 acres of additional snowmaking. Snowmaking infrastructure would remain identical to the Proposed Action.

3.3.5 GUEST SERVICES AND OPERATIONS

All Eagle Mountain and Moose Mountain guest services and operations facilities would remain identical to the Proposed Action except for the Moose Mountain Chalet, which would be relocated approximately 47 feet to the southeast to address skier circulation of the modified trail alignment. In addition, a 0.1-acre facility would be developed near the bottom of Lift 7 for utilities, storage, and snowmaking booster pump.

3.3.6 CONSTRUCTION, MAINTENANCE, AND UTILITIES

Existing Snowmobile and Hiking Trail Realignment

The realignment of the existing snowmobile trail within the proposed Eagle Mountain SUP area would be identical to the Proposed Action. Under this alternative, the SHT/NCNST would be avoided and the SHT/NCNST would not require reroute.

Access Roads

Approximately 4.5 miles of new permanent access road and approximately 1-mile of temporary access road are proposed under Alternative 3, that is approximately 0.5 miles less of permanent access roads than the Proposed Action. Temporary mountain road length is similar between the two alternatives.

Utilities

All proposed utilities under Alternative 3 would be identical to the Proposed Action except for an additional 0.3-acre stormwater pond located at the base of Lift 7.

Tree Removal and Grading

The acreage of tree removal would increase by 0.28 acres with the addition of the Lift 7 egress compared to the Proposed Action. Tree removal and grading practices would be identical to the Proposed Action.

4 METHODS

Wetlands and other waters of the U.S. within LMC's Analysis Area were delineated in 2017 and 2020. Most of the wetland delineation for the Eagle Mountain and Moose Mountain SUP was completed by Leggette, Brashears & Graham, Inc. (LBG) in 2017. LBG was acquired by WSP USA, Inc. (WSP) in 2018. WSP completed additional wetland delineations on private lands and NFS SUP lands added to the Analysis Area in 2020. Rob Peterson, a Minnesota Certified Wetland Delineator and a certified Professional Wetland Scientist, was the Lead Environmental Scientist completing the wetland delineations for both LBG and WSP.

4.1 WETLANDS

Wetlands present within the Analysis Area were identified and delineated using the procedures described in the USACE Wetlands Delineation Manual (Environmental Laboratory, Waterways Experiment Station, 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (US Army Engineer Research and Development Center, 2011). These methods utilize the standard multi-parameter approach (vegetation, hydrology, and soils) for wetland identification as outlined in the USACE Wetland Determination Data Forms. In general, an area is considered a wetland if hydrophytic vegetation, wetland hydrology, and hydric soils are present. Delineated wetlands were classified in accordance with the classification systems outlined in Wetlands of the United States (Shaw and Fredine, 1971, USFWS Circular 39), Wetland Plants and Plant Communities of Minnesota and Wisconsin (Eggers and Reed, 2014), and Wetlands and Deepwater Habitats of the United States (Cowardin et al., 1979, FWS/OBS Publication 79/31). The wetland delineation followed the USACE procedure for identifying wetland boundaries by completing the appropriate number of sampling points, investigating the required wetland criteria, and identifying the boundary between wetland and upland areas. All wetland boundaries within the Analysis Area were geolocated using a sub-meter accuracy global positioning system (GPS) and incorporated into a geographic information system (GIS) using ArcGIS 10.7 GIS software. Springs and seeps were also identified and mapped as points. Springs and seeps were generally located at the head of wetlands or streams and were included within the mapped boundary of the associated wetland or stream.

4.1.1 SEASONAL PONDS

The wetland delineation included a specific survey for seasonal ponds, often called vernal pools or seasonally flooded basins. The Superior National Forest (SNF) Forest Plan (USDA Forest Service, 2004) has specific guidelines for seasonal ponds in northern hardwood forests. The Minnesota Forest Resource Council also has guidelines recommending avoiding seasonal ponds whenever possible. Emily Creighton, Hydrologist with the Forest Service, provided WSP with specific northern hardwood stand GIS locations as well as potential seasonal pond locations derived from a Forest Service GIS mapping tool.. WSP completed a seasonal pond survey of the northern hardwood stands within the SUP on May 6th and 7th, 2020. The survey included visual observation of the identified potential seasonal pond locations and well as a meander survey of the northern hardwood stands listening for frog calling. Many of the potential seasonal pond locations provided by the Forest Service were located in depressional landscape features but in most cases had an outlet for seasonal precipitation and snow melt to escape and were not observed to be closed depressions. In addition to the specific seasonal pond survey, WSP also made observation for seasonal ponds while completing wetland delineation activities throughout the Analysis

Area. Seasonal ponds were not observed during the May 2020 seasonal pond survey nor during any other wetland delineation field visits. The lack of seasonal ponds is expected given the steep slopes throughout the Analysis Area.

4.2 OTHER WATERS OF THE U.S.

Other waters of the U.S. identified within the Analysis Area consisted of intermittent and ephemeral streams. Intermittent streams were classified as streams with flow derived from groundwater (seeps and springs) with supplemental flow from precipitation runoff. Ephemeral streams were classified as streams with precipitation runoff as the primary source of water. For the purposes of this survey, if a seep or spring was observed contributing water to a stream channel then the stream was identified as intermittent. If no seep or spring was observed, then the stream was identified as ephemeral. The duration of flow was not observed with enough frequency to classify streams as perennial (having year-round flow). The definition of “Waters of the United States, under the Navigable Waters Protection Rule that became effective on June 22, 2020 may exclude ephemeral streams. The final rule distinguishes ephemeral flow resulting from a snow fall event from sustained intermittent flow resulting from melting snowpack that is continuous for weeks or months. For the purposes of this report, all ephemeral and intermittent streams are assumed to be jurisdictional by the USACE.

Streams were mapped with GPS as lines where there was a well-defined bed and bank without a riparian wetland habitat. The stream GPS lines were collected along the observed ordinary high water mark. In areas where the stream contained a wetland riparian area, these areas were mapped within the wetland boundary and are quantified and described as wetlands in this report. The riparian wetlands typically occurred in areas where the stream slope significantly decreased and the stream flow was not contained within a channel. In these areas, the migration of water was distributed over a wide area with flow through saturated soil.

None of the streams within the Analysis Area are currently identified on the National Hydrography Dataset. Additional details related to the streams and hydrology of the Analysis Area can be found in the Hydrology Technical Report being completed for this project.

5 AFFECTED ENVIRONMENT

5.1 GENERAL WETLAND DESCRIPTIONS

Approximately 27.14 acres of wetlands were identified within the 715-acre Analysis Area including 17.21 acres of wetlands in the Moose Mountain area and 9.93 acres of wetlands in the Eagle Mountain area. In addition, 6,519 linear feet of intermittent and ephemeral streams were identified within the Analysis Area. Most of the wetlands within the Analysis Area are Type 7 – Wooded Swamps that consist of Hardwood Swamp and Coniferous Swamp. In addition to the Wooded Swamps, a couple of small Type 2 – Inland Fresh Meadow (Sedge Meadow) wetlands were identified along the snowmobile trail in the Eagle Mountain area. **Table 1** contains a summary of the type and size of wetlands and streams present within the Analysis Area.

Table 1: Waters of the U.S. within the Analysis Area

WETLAND TYPE (SHAW AND FEDERLINE; EGGERS AND REED)	STREAM TYPE	AREA (ACRES)	LENGTH (FEET)
Moose Mountain			
Type 7; Hardwood Swamp	-	5.62	-
Type 7; Coniferous Swamp	-	11.59	-
-	Intermittent	-	3,065
-	Ephemeral	-	1,991
Subtotal	-	17.21	5,056
Eagle Mountain			
Type 7; Hardwood Swamp	-	9.87	-
Type 2; Sedge Meadow	-	0.06	-
-	Intermittent	-	904
-	Ephemeral	-	599
Subtotal	-	9.93	1,463
Total	-	27.14	6,519

Groundwater discharge and/or runoff supports wetland hydrology within the Analysis Area. Many of the wetlands are associated with seeps or springs and located within the riparian areas of intermittent and ephemeral streams. Most of the seeps, springs, intermittent streams, and ephemeral streams originate at the base of the steep slopes of Moose and Eagle Mountains. This slope break closely follows the geologic contact between the Leveaux ferrodiorite and the Good Harbor bay andesite. Groundwater plus runoff, or, in some cases, runoff-only discharge to the land surface along this slope break forms the intermittent and ephemeral streams. In relatively steep areas the streams have a well-defined bed and bank. In areas where the slope is more gradual, the water spreads out forming wetland plant communities with saturated soils; there, water flows through saturated soil instead of defined channels.

The Soil Resources Report of Cook County (USDA-NRCS, 2020) identifies the predominant soils underlying the wetlands as soil map units B1-20B; Hegberg-Eldes complex; B1-40B, Augustana-Hegberg complex; and G1-10D, Augustana, colluvial mantle-Hegberg, colluvial mantle-Mesaba, stony complex. These soils are formed from glacial till on ground moraines. The B1-20B map unit is classified as 33-65% hydric with all three soil map units having minor components identified as being depressional. Soils in the wetland areas were observed to meet the USDA Field Indicators of Hydric Soils in the United States as described in the following sections. Additional details related to soils within the Analysis Area can be found in the Soil Technical Report being completed for this project.

5.2 DETAILED WETLAND DESCRIPTIONS AND WETLAND FUNCTIONAL ASSESSMENT

This section provides further detail of the observed wetlands within the Analysis Area including information on the wetland functional assessment. Twenty-seven wetlands were delineated within the Analysis Area and were identified as Wetland 1 – Wetland 27. Twenty-three wetlands were identified in the Moose Mountain SUP and four wetlands were identified in the Eagle Mountain SUP. Specifics of observed vegetation, hydrology, and soil characteristics of the wetlands are presented in sections 5.2.1 and 5.2.2. Detailed Wetland Maps are included in **Appendix B – Appendix E**.

Wetland functional assessments use monitoring and evaluation frameworks to gauge aspects of wetland quality. Several wetland quality monitoring and assessment methods have been developed in Minnesota and include the Minnesota Routine Assessment Method (MnRAM), a hydrogeomorphic (HGM) functional assessment approach for prairie potholes, and the Floristic Quality Assessment (FQA) for Minnesota Wetlands. Support for MnRAM has waned as new approaches to wetland functional assessments have been developed nationally. The HGM approach relies on the development of regional methodologies specific to regional ecosystems that have not been developed for the wetland types within the Analysis Area. The FQA is a vegetation based ecological condition assessment approach that has increasingly been used for wetland monitoring and assessment.

FQA is based on the Coefficient of Conservatism (C), which is a numerical rating (0 – 10) of an individual plant species' fidelity to specific habitats and tolerance of disturbance – natural or anthropogenic (MPCA, 2014). Species that have narrow habitat requirements and/or little tolerance to disturbance have high C-values and vice versa. FQA metrics are derived from on-site vegetation sampling data and the C-values. They have repeatedly been found to be responsive and reliable wetland condition indicators (MPCA, 2014). The most prominent FQA metrics are the Mean C (the average Coefficient of Conservatism) and the FQI (the square root of the native species richness multiplied by the Mean C). While many different metric calculations can be made for the FQA, the primary assessment metric is the weighted Coefficient of Conservatism (wC). wC is the sum of each species' proportional abundance for a community multiplied by its C-value.

The Minnesota Pollution Control Agency (MPCA) developed a Rapid FQA to provide more broad usage of the FQA. The Rapid FQA is a popular assessment method because of its simplified sampling approach that can be done rapidly with available assessment criteria to translate the data into meaningful results. Through consultation with the Forest Service, it was decided that the Rapid FQA was an appropriate wetland functional assessment approach for this project. WSP completed the Rapid FQA using the procedures described in the *Rapid Floristic Quality Assessment Manual* (MPCA 2014). The basic procedure of the Rapid FQA includes: identifying an Assessment Area (AA) based on wetland plant community, completing a progressive timed meander sampling

approach for the AA recording the plant species present along with cover class, and entering the data into the Rapid FQA calculator to calculate and convert metrics into a Biological Condition Gradient (BCG; **Table 2**). The preferred Rapid FQA seasonal sampling period is generally June-September when FQA metrics were found to be stable and most wetland plant species can be readily identified. WSP completed the Rapid FQA on July 1, 2020. The results of the Rapid FQA are presented below along with a more detailed description of wetlands within the Analysis Area.

Table 2: Wetland Vegetation Biological Condition Gradient

CONDITION CATEGORY	DESCRIPTION
Exceptional (1)	Community composition and structure as they exist (or likely existed) in the absence of measurable effects of anthropogenic stressors representing pre-European settlement conditions. Non-native taxa may be present at very low abundance and not causing displacement of native taxa.
Good (2)	Community structure similar to natural community. Some additional taxa present and/or there are minor changes in the abundance distribution from the expected natural range. Extent of expected native composition for the community type remains largely intact.
Fair (3)	Moderate changes in community structure. Sensitive taxa are replaced as the abundance distribution shifts towards more tolerant taxa. Extent of expected native composition for the community type diminished.
Poor (4)	Large to extreme changes in community structure resulting from large abundance distribution shifts towards more tolerant taxa. Extent of expected native composition for the community type reduced to isolated pockets and/or wholesale changes in composition.
Absent (5)	Plant life only marginally supported or soil/substrate largely devoid of hydrophytic vegetation due to ongoing severe anthropogenic impacts

5.2.1 MOOSE MOUNTAIN

Twenty-three wetlands were identified in the Moose Mountain SUP and labeled as Wetland 1 – Wetland 23. The Moose Mountain wetlands can be divided into two distinct areas: the northwest base of Moose Mountain and the southeast base of Moose Mountain. Wetlands 1 and 2 are located along the northwest base of Moose Mountain at the boundary of the Moose Mountain SUP and are part of a large wetland along Rollins Creek. This wetland is a Type 7, Coniferous Swamp plant community with the following wetland indicators:

- Vegetation is dominated by northern white cedar (*Thuja occidentalis*) with red maple (*Acer rubrum*), white birch (*Betula papyrifera*), and balsam fir (*Abies balsamea*) subdominant in the tree canopy. The shrub layer is sparse with speckled alder (*Alnus incana*), mountain maple (*Acer spicatum*) and balsam fir. The ground layer includes yellow bluebead-Lily (*Clintonia borealis*), bunchberry (*Cornus Canadensis*), three-leaf goldthread (*Coptis trifolia*), dwarf raspberry (*Rubus pubescens*), long-stalked sedge (*Carex pedunculata*), and Sphagnum species.
- Sampling points completed in Wetlands 1 and 2 meet primary wetland hydrology criteria A2 – High Water Table, A3 – Saturation, and C1 – Hydrogen Sulfide Odor.
- Hydric soil indicators A3 – Black Histic, A4 – Hydrogen Sulfide, and A11 – Depleted Below Dark Surface are present.

This wetland is classified on the National Wetland inventory (NWI) as PFO4B (Palustrine Forested Needle-Leaved Evergreen Saturated). The Rapid FQA completed on Wetland 1 and 2 resulted in a weighted Coefficient

of Conservatism (wC) of 5.7 with a Floristic Quality Index (FQI) of 25.1. These values return a Wetland Vegetation Biological Condition Gradient condition category of Exceptional (1), indicating that the plant community exists in the absence of measurable effects of anthropogenic stressors (Table 2).

Wetlands 3 – 23 are located along the southeast base of Moose Mountain where seeps, springs, intermittent streams, and ephemeral streams originate at the base of the steep, upper slopes. In relatively steep areas the streams have a well-defined bed and bank. In areas where the slope is more gradual, the water spreads out forming wetland plant communities with saturated soils. These wetlands are all very similar with the primary difference being the conifer component in the canopy. Wetlands 3 – 23 are Type 7, Hardwood Swamps and Type 7, Coniferous Swamps with the following wetland indicators:

- The Hardwood Swamps are dominated by black ash (*Fraxinus nigra*) and red maple in the canopy with the Coniferous Swamps dominated by northern white cedar. The shrub layer is sparse with speckled alder, mountain maple and balsam fir. The ground layer includes bluejoint (*Calamagrostis canadensis*), fowl bluegrass (*Poa palustris*), bunchberry, dwarf raspberry (*Rubus pubescens*), greater bladder sedge (*Carex intumescens*), and spotted touch-me-not (*Impatiens capensis*).
- The primary hydrology criteria observed in sampling points completed in Wetlands 3 - 23 was A2 – High Water Table and A3 – Saturation.
- Hydric soil indicators A11 – Depleted Below Dark Surface and F1 – Loamy Mucky Mineral were most common with A3 – Black Histic and A4 – Hydrogen Sulfide present in some areas.

None of the wetlands along the southeast side of Moose Mountain were identified on the NWI. The Rapid FQA completed on Wetlands 3 - 23 resulted in a weighted Coefficient of Conservatism (wC) ranging from 4.6 to 5.8 with Floristic Quality Index (FQI) ranging from 18.1 to 20.6. These values return a condition category of Exceptional (1), indicating that the plant community exists in the absence of measurable effects of anthropogenic stressors (Table 2).

The exceptional condition category results for the Moose Mountain wetland plant communities was expected. The Moose Mountain wetlands consist of high-quality, undisturbed, old-growth upland cedar forest with trees including northern white cedar estimated to over 140 years old (MNR, 2020). These wetland plant communities contained high native species richness values of species with narrow habitat requirements and/or little tolerance to disturbance. There was little evidence of anthropogenic disturbance likely due to the remoteness and steep terrain of these locations.

5.2.2 EAGLE MOUNTAIN

The wetlands within the Eagle Mountain SUP consist of a large Type 7, Hardwood Swamp (Wetland 27) and two small Type 2, Sedge Meadows (Wetland 25 and Wetland 26) located along the southern base area. Another Type 7, Hardwood Swamp (Wetland 24) is located along a terrace within the upper slopes on private lands.

Ephemeral drainages in the upper watershed and groundwater seeps supply hydrology to Wetland 27 where Eagle Mountain's main slope begins to decrease in grade. Wetland 27 is a Type 7, Hardwood Swamp with the following wetland indicators:

- Vegetation is dominated by black ash and red maple in the canopy with speckled alder being dominant to subdominant in the shrub layer. The ground layer includes bunchberry, dwarf raspberry, greater bladder sedge, and spinulose wood fern (*Dryopteris carthusiana*).

- Sampling points completed in Wetland 27 meet primary wetland hydrology criteria A2 – High Water Table and A3 –
- Saturation. Hydric soil indicators A11 – Depleted Below Dark Surface and F1 – Loamy Mucky Mineral are present.

Wetland 27 is not identified on the NWI. The Rapid FQA completed on Wetland 27 resulted in a weighted Coefficient of Conservatism (wC) of 4.0 with a Floristic Quality Index (FQI) of 15.5. These values return a condition category of Fair (3), indicating that there have been moderate changes in plant community structure. The Hardwood Swamp condition category of fair ranges from wC values of 2.5 – 4.2. The wC value for Wetland 27 of 4.0 was on the high end of the fair category range and was close to a condition category of Good (2). The fair rating seems appropriate considering the lower species diversity and lower C-values of the observed species. The fair rating may be a result of land use changes in this area of Eagle Mountain. This wetland is downgradient from a snowmobile trail, Eagle Mountain Lane, and evidence of historic logging activities were observed (cut stumps).

Wetland 25 and Wetland 26 are small Type 2, Sedge Meadows that occur on the snowmobile trail. These wetlands are likely incidental from trail compaction and rutting. The source of hydrology for these wetlands is likely from precipitation runoff. No springs or seeps were observed. Regardless of origin, both areas have developed wetland vegetation, hydric soils, and hydrology. Wetlands 25 and 26 are very similar with the following wetland indicators:

- Vegetation is dominated by woolgrass (*Scirpus cyperinus*), awl-fruited sedge (*Carex stipata*), pointed broom sedge (*Carex scoparia*), and silvery sedge (*Carex canescens*) in the ground layer. The tree and shrub layer are absent.
- Sampling points completed in Wetlands 25 and 26 meet primary wetland hydrology criteria A2 – High Water Table and A3 – Saturation.
- Hydric soil indicator F6 – Redox Dark Surface are present.

Wetlands 25 and 26 are not identified on the NWI. The Rapid FQA completed on Wetlands 25 and 26 resulted in a weighted Coefficient of Conservatism (wC) of 3.0 with a Floristic Quality Index (FQI) of 10.5. These values return a condition category of Fair (3), indicating that there have been moderate changes in plant community structure. The Sedge Meadow condition category of fair ranges from wC values of 1.8 – 5.5. The wC value for Wetlands 25 and 26 of 3.0 is in the middle of the fair category range. The fair rating is appropriate considering these wetlands are located on the snowmobile trail which is routinely cleared of trees and shrubs and occasionally mowed. These wetlands are also impacted by recreational vehicle rutting and compaction.

Wetland 24 is a Type 7, Hardwood Swamp located along a terrace within the upper slopes of Eagle Mountain on private lands. The source of hydrology of Wetland 24 is likely a combination of groundwater discharge and precipitation runoff. A seep was observed in the northeast corner of the wetland providing primary hydrology with precipitation runoff contributing to the wetland from the upper slopes. Wetland 24 is a Type 7, Hardwood Swamp with the following wetland indicators:

- Vegetation is dominated by black ash in the tree layer with speckled alder in the shrub layer. The ground layer includes fowl bluegrass, fowl manna grass (*Glyceria striata*), dwarf raspberry, spotted touch-me-not, and cottongrass bulrush (*Scirpus cyperinus*).

- Sampling points completed in Wetland 24 meet primary wetland hydrology criteria A2 – High Water Table and A3 – Saturation.
- Hydric soil indicators A3 – Black Histic are present.

Wetland 24 is not identified on the NWI. The Rapid FQA completed on Wetland 24 resulted in a weighted Coefficient of Conservatism (wC) of 3.7 with a Floristic Quality Index (FQI) of 16.3. These values return a condition category of Fair (3), indicating that there have been moderate changes in plant community structure. The Hardwood Swamp condition category of fair ranges from wC values of 2.5 – 4.2. The wC value for Wetland 24 of 3.7 was on the high end of the fair category range. A higher condition rating would be expected from Wetland 24 since it is in a relatively undisturbed area. Wetland 24 contained relatively lower species richness and overall lower C-values. The fair rating may be a result of the observed historic logging activities in this area of Eagle Mountain.

Table 3: Summary of Wetland Functional Assessment

WETLAND	RAPID FQA CONDITION CATEGORY
Moose Mountain SUP, Wetland 1 and Wetland 2	Exceptional (1): Community composition and structure as they exist (or likely existed) in the absence of measurable effects of anthropogenic stressors representing pre-European settlement conditions. Non-native taxa may be present at very low abundance and not causing displacement of native taxa.
Moose Mountain SUP, Wetlands 3 – 23	Exceptional (1): Community composition and structure as they exist (or likely existed) in the absence of measurable effects of anthropogenic stressors representing pre-European settlement conditions. Non-native taxa may be present at very low abundance and not causing displacement of native taxa.
Eagle Mountain SUP, Wetlands 24 - 27	Fair (3): Moderate changes in community structure. Sensitive taxa are replaced as the abundance distribution shifts towards more tolerant taxa. Extent of expected native composition for the community type diminished.

6 REGULATORY COMPLIANCE

6.1 CLEAN WATER ACT, MINNESOTA WETLAND CONSERVATION ACT, AND EO 11990

The St. Paul District of the USACE is the federal agency that regulates discharges of dredged or fill material into waters of the United States (wetlands, tributaries, lakes, etc.) under Section 404 of the Clean Water Act (CWA) within the Lutsen Mountains SUP. As a federal agency working on federal lands, the NFS is not currently regulated by the Minnesota Wetland Conservation Act (WCA). The USACE and the Minnesota WCA regulates activities affecting wetlands in Minnesota on private lands. Approximately 20% of the proposed wetland impacts under the Proposed Action are located within connected actions on private lands. A permit from the USACE may be required for both permanent and temporary wetland impacts within the SUP. A permit from the USACE and state of Minnesota may be required for both permanent and temporary wetland impacts on private lands. Additional direction regarding wetland management for the USACE and Forest Service is provided by Presidential Executive Order 11990 – Protection of Wetlands. Executive Order (EO) 11990 requires federal agencies to avoid to the extent practicable, long- and short-term adverse impacts associated with the destruction or modification of wetlands. More specifically, EO 11990 directs federal agencies to avoid new construction in wetlands unless there is no reasonable alternative. Executive Order 11990 states further that where wetlands cannot be avoided, the Proposed Action must include all practicable measures to minimize harm to wetlands. As required by EO 11990, the CWA, and the WCA, avoidance and minimization measures were considered through the planning process for the proposed projects. This report also identifies Best Management Practices (BMPs) and Project Design Criteria (PDC) that would be implemented to further avoid and minimize impacts to wetlands and other waters of the U.S. A full list of the and BMPs and PDC are provided in Section 10.0 of this report. Finally, the USACE and WCA policy of no net loss of wetlands requires compensatory mitigation for wetland impacts. The type and amount of wetland mitigation for these projects would be determined during a future CWA and WCA permit process.

6.2 SUPERIOR NATIONAL FOREST LAND AND RESOURCE MANAGEMENT PLAN (FOREST PLAN)

A Forest Plan Consistency Analysis was prepared, which considers the alternatives in the context of the applicability and relevance of each standard and guideline contained in the SNF 2004 Forest Plan. Several standards and guidelines applicable to the wetlands component of the current project and listed below are found in the Watershed Health, Riparian Areas, and Soil Resources, Standards & Guidelines, Wetlands section.

- G-WS-12, Use of wetlands under frozen conditions for temporary roads and skid trails will generally be permitted as long as no fill is placed in the wetland. These roads or trails will be blocked to discourage vehicle use under unfrozen conditions.
- G-WS-13, Wetland impacts will be avoided whenever possible. Where impacts are unavoidable, minimize and compensate for loss when undertaking projects.
- S-WS-13, Where utility rights-of-way are constructed across wetlands, the crossings will be designed and maintained to preserve hydrologic and riparian function.

- G-WS-14, Avoid felling trees into non-forested wetlands, except where done for purposes of habitat restoration.
- G-WS-15, Wetlands will be managed to prevent the reduction of their water quality, fish and wildlife habitat, and aesthetic values. Management actions will not reduce water quality within a wetland, or upstream or downstream of a wetland, unless restoration of natural conditions is the primary goal of the activity.

The Proposed Action includes ground-disturbing activities within wetlands. Ground-disturbing activities within wetlands will be avoided and minimized with the recommended BMPs and PDC as listed in Section 10.0. Wetland impacts that cannot be avoided and minimized by project BMPs and PDC may require wetland mitigation as part of the approval process under the USACE CWA Section 404 and WCA permitting process.

6.3 MINNESOTA FOREST RESOURCES COUNCIL

The Minnesota Forest Resources Council (MFRC) was charged under the Sustainable Forest Resources Act of 1995 with coordinating the development of site-level timber harvesting and forest management guidelines; it developed general and activity-specific guidelines for riparian zone and wetland management, wildlife habitat, historic/cultural resources and forest soil productivity (MFRC 2012). The MFRC general guidelines related to water resources include provisions to protect the hydrology and hydraulics, connectivity, water quality, habitat value, and geomorphological setting of streams, open-water and non-open water wetlands, lakes, and seasonal ponds. Activity-specific wetland guidelines have been developed for forest roads, timber harvesting, mechanical site preparation, pesticide use, reforestation, timber stand improvement, fire management, forest recreation management, and biomass harvesting.

The following discussion of the direct and indirect environmental consequences identifies potential adverse effects to wetlands and other waters of the U.S. associated with the proposed action and lists BMPs and PDC that would be used to mitigate such adverse effects.

7 DIRECT AND INDIRECT ENVIRONMENTAL CONSEQUENCES

The Proposed Action and Resource Protection Alternative have the potential to cause direct and indirect impacts to wetlands and other waters of the U.S. The potential impacts have been grouped into direct (permanent and temporary) and indirect impacts. Permanent impacts include the permanent discharge of dredge or fill material that result in the loss of wetland or stream acreage or length. Temporary impacts exist only for the duration of project construction, after which the wetland is restored to the previous undisturbed condition. Temporary impacts are presumed to result in retention of wetland or stream acreage/length and ultimately wetland or stream function if best management practices are followed. Both permanent and temporary impacts would be considered direct impacts and per the National Environmental Policy Act (NEPA), are caused by the action and occur at the same time and place (CFR 1508.8). All direct impacts to wetlands or streams would be coordinated with the USACE, WCA local governing unit (on private lands), and the Forest Service hydrologist.

Indirect impacts cause changes to wetland acreage, quality, or function from activities other than the direct discharge of dredge or fill material. Indirect impacts may include changes in plant community structure via tree removal, alteration of hydrologic patterns via dewatering, soil compaction, competition from invasive and noxious weeds, increased soil erosion or sedimentation, reduction of Rapid FQA BCG, and/or non-compliance with EO 11990. These indirect impacts are best described as indirect effects per NEPA; that is, they are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable (CFR 1508.8).

The USACE Nationwide Permit number 42 (NWP 42) – Recreational Facilities, authorizes the discharge of dredged or fill material into waters of the U.S. for the construction or expansion of recreational facilities including ski areas. The discharge may not cause the loss of greater than 0.5 acres of non-tidal water of the U.S. Temporary impacts to waters of the US, are calculated separately from losses of waters of the US, and do not contribute to loss thresholds. Discharges resulting in the loss of greater than 0.5 acres require authorization under an Individual Permit. Indirect impacts are considered by the USACE district engineer when making minimal adverse environmental effects determinations on a case-by-case basis.

7.1 ALTERNATIVE 1 – NO ACTION

Under the No Action Alternative, there would be a continuation of existing management practices without changes, additions, or upgrades. The SUP permit application for LMC would not be approved and no additional roads, buildings, parking lots, lifts, trails and associated snowmaking, or recreation opportunities would be constructed on NFS lands. Under the No Action Alternative no additional direct or indirect impacts to wetland resources on NFS lands would occur. The effects of snowmaking on the existing Moose Mountain and Eagle Mountain ski terrain would continue to increase the hydrologic budget in those areas. No other effects under the No Action Alternative are anticipated.

7.2 ALTERNATIVE 2 – PROPOSED ACTION

In accordance with EO 11990, the Proposed Action was designed to avoid and minimize impacts to wetlands wherever possible. For example, the Moose Mountain base area facilities and parking are proposed for

construction in locations with the highest percentage of contiguous upland to avoid and minimize impacts to adjacent wetlands. Similarly, the Eagle Mountain base area facilities, roads, parking, and lift terminal were significantly redesigned to avoid impacts to the large wetland at the base of Eagle Mountain. PDC have been developed to further avoid and minimize impacts to wetlands. PDC have been developed to shift or relocate roads and parking to avoid seeps, wetlands, and streams. Other PDC limit the disturbance width of snowmaking lines to minimize the disturbance width to 20 feet. Another PDC has been developed to install clay cutoff walls in any snowmaking or utility line trench within or adjacent to wetlands to avoid draining the subsurface hydrology and dewatering the wetland. A full list of the BMPs and PDC are provided in Section 10.0 of this report. **Table 4** summarizes the wetland impacts from the Proposed Action and **Table 5** summarizes the stream impacts from the Proposed Action. **Table 4 and Table 5** also include details on what the wetland and stream impacts would be if PDC were implemented for the proposed projects (shown in red text). The PDC number **Table 4 and Table 5** correspond to the PDC numbers in **Table 8** in Section 10.0. Further details on the direct and indirect effects are provided in the following sections. **Appendix B – Appendix D** contain detailed maps of the wetland resources and identifies the location of direct and indirect effects. The direct and indirect impacts are identified on the maps and in the tables by wetland impact number.

Table 4: Wetland Impact Summary – Proposed Action

PROJECT NAME	WETLAND IMPACT NUMBER ¹ (Type) ³	PDC NUMBER APPLIED ²	DIRECT IMPACT		INDIRECT IMPACT	
			PERMANENT (ACRES)	TEMPORARY (ACRES)	TREE REMOVAL (ACRES)	DEWATERING (ACRES)
Moose Base Facilities	W11l, W11k (Type 7)	-	0.01	-	-	-
Moose Mtn Base Area Roads and Parking	W11j, W11o, W11n, W12a, W14d, W14e, W14f, W14g, W14h, W14i, W14n, W15a, W15b, W21a, W22a, W23a (Type 7)	4, 6, 8	0.49 0.17	-	-	7.21 0.00
Moose Mtn Mountain Roads	W2c, W14c (Type 7)	7	0.11 0.03	-	-	-
Moose Mtn Snowmaking Line	W3a, W4a, W4b, W9a, W11m, W14j, W14k (Type 7)	11	-	0.15	-	0.57 <0.57 ⁴
Moose Mtn Powerline	W11f, W11g, W11h, W11i, W22b (Type 7)	13	-	0.18 0.11	-	-
Moose Mtn Lift 3 Egress	W6b (Type 7)	-	-	-	0.01	-
Moose Mtn Ski Trails	W2a, W6a, W11a, W11b, W11c, W14a, W14b (Type 7)	-	-	-	0.29	-
Moose Mtn SHT Reroute	W1a (Type 7)	14	0.02 0.00	-	-	-
Moose Mtn Lift Terminals	W1b, W2b, W11d, W11e (Type 7)	-	0.23	-	-	-
Subtotal without PDC Subtotal with PDC	-	-	0.86 0.46	0.33 0.26	0.30	7.78 <0.57⁴
Eagle Mtn Base Parking	W25a (Type 2)	-	0.02	-	-	-
Eagle Mtn Ski Trails	W24a, W27a, W27b (Type 7)	-	-	-	0.48	-
Eagle Mtn Surface Lift	W26a (Type 2)	-	0.003	-	-	-
Subtotal	-	-	0.02	-	0.48	-
Total without PDC (% of Total Wetlands) Total with PDC (% of Total Wetlands)	-	-	0.88 (3.2%) 0.47 (1.7%)	0.33 (1.2%) 0.26 (0.96%)	0.77 (2.8%)	7.78 (28.7%) <0.57⁴

¹ Wetland impact number corresponds to wetland impacts identified on the Wetland Maps in Appendix B and Appendix C.

² PDC number corresponds to the PDC numbers in Table 8 in Section 10.0.

³ All wetland impacts are Type 7, Wooded Swamps except for wetland impact number W25a and W26a which are Type 2, Sedge Meadows

⁴ While complete effectiveness of dewatering prevention methodologies is unknown at this time, correct installation of cut off walls and other methodologies would minimize or eliminate dewatering. Please refer to section 7.22 for additional details regarding dewatering prevention.

Red text identified the proposed impact if the recommended PDC is implemented for the proposed projects.

Table 5: Stream Impact Summary – Proposed Action

PROJECT NAME	STREAM TYPE	STREAM IMPACT NUMBER	PDC NUMBER APPLIED	DIRECT IMPACT		INDIRECT IMPACT
				PERMANENT (FEET)	TEMPORARY (FEET)	TREE REMOVAL (FEET)
MOOSE MOUNTAIN						
Moose Mtn Base Parking	Ephemeral	S11	6	119 0	-	-
Moose Mtn Lift 3 BT	Ephemeral	S4	-	126	-	-
Moose Mtn Mountain Road	Ephemeral	S6, S2	5, 7	113 0	-	-
Moose Mtn Snowmaking Line	Ephemeral	S13, S14, S15	-	-	305	-
Moose Mtn Ski Trails	Ephemeral	S1, S3, S5, S9	-	-	-	521
Moose Mtn Lift 3 Egress	Ephemeral	S7	-	-	-	191
Moose Mtn Base Area Road	Intermittent	S12, S16, S17, S19, S21	5	367 0	-	-
Moose Mtn Powerline	Intermittent	S18, S20, S22	13	-	271 23	-
Moose Mtn Ski Trails	Intermittent	S8, S10	-	-	-	533
Moose Mtn Lift 3 Egress	Intermittent	S7	-	-	-	50
Subtotal without PDC Subtotal with PDC	-	-	-	725 126	576 328	1,295
EAGLE MOUNTAIN						
Eagle Mtn Base Area	Ephemeral	S24	-	68	-	-
Eagle Mtn Base Area Parking	Ephemeral	S23	-	136	-	-
Eagle Mtn Ski Trails	Ephemeral	S25, S29	-	-	-	250
Eagle Mtn Ski Trails	Intermittent	S26, S27, S28	-	-	-	358
Subtotal	-	-	-	204	-	608
Total without PDC (% of Total Stream Length) Total with PDC (% of Total Stream Length)	-	-	-	929 (14%) 330 (5%)	576 (9%) 328 (5%)	1903 (29%)

¹ Stream impact number corresponds to stream impacts identified on the Stream Maps in Appendix D.

²PDC number corresponds to the PDC numbers in Table 8 in Section 10.0.

Red text identified the proposed impact if the recommended PDC is implemented for the proposed projects.

7.2.1 DIRECT WETLAND IMPACTS

Permanent Wetland Impacts

Of over 27 acres of wetland identified within the Analysis Area, the Proposed Action would result in 0.88 acres of permanent wetland impacts. Permanent impacts to Type 7, Hardwood and Coniferous Swamps in the Moose Mountain SUP would occur from fill and grading of the base area facilities (0.01 acres), base area roads and parking (0.49 acres), mountain roads (0.11 acres), and lift terminals (0.23 acres). Permanent impacts to Type 2, Sedge Meadow in the Eagle Mountain SUP would occur from fill and grading of the base area parking (0.02 acres) and the surface lift (0.003 acres).

Implementation of avoidance and minimization PDC would reduce permanent wetland impacts from the Proposed action from 0.88 acres to 0.47 acres. PDC that would reduce permanent wetland impacts include: spanning seeps and wetlands to avoid disrupting water supply or drainage patterns (PDC 4), redesigning or relocation of parking lots to avoid seeps and wetlands (PDC 6), relocating Moose Mountain Road 3 to the east (PDC 7), relocating Moose Mountain base area road 25 feet east (PDC8), and elevating the Superior Hiking Trail reroute over the wetland with a boardwalk (PDC 14).

Permanent Stream Impacts

Of over 6,500 linear feet of streams within the Analysis Area, the Proposed Action would result in 929 linear feet of permanent stream impacts. Permanent impacts to ephemeral and intermittent streams in the Moose Mountain SUP would occur from fill and grading of the base area parking (119 feet), base area road (367 feet), Lift 3 BT Terminal (126 feet), and mountain roads (113 feet). Permanent impacts to ephemeral and intermittent streams in the Eagle Mountain SUP would occur from fill and grading of the base area (68 feet) and base area parking (136 feet).

Implementation of avoidance and minimization PDC would reduce permanent stream impacts from the Proposed action from 929 feet to 330 feet. PDC that would reduce permanent stream impacts include: spanning the stream or using the appropriate sized culvert (PDC 5), redesigning or relocation of parking lots to avoid streams (PDC 6) and relocating Moose Mountain Road 3 to the east (PDC 7).

Temporary Wetland Impacts

The Proposed Action would result in a total of 0.33 acres (1.2% of total wetland acreage) of temporary wetland impacts from the installation of the snowmaking line and powerline assuming a 20-foot-wide disturbance corridor. PDC 13, recommending installation of the powerline within the road grade fill at wetland crossings would reduce temporary wetland impacts from the Proposed Action from 0.33 acres to 0.26 acres. Where feasible, installing the powerline using a cable plowing method or similar would further reduce temporary wetland impacts by reducing the width of the disturbance corridor (PDC 12). Impact reduction would depend on the exact installation method and equipment.

Temporary Stream Impacts

The Proposed Action would result in 576 linear feet (9% of total Stream length) of temporary stream impacts from the installation of the snowmaking line and powerline assuming a 20-foot wide disturbance corridor. PDC 13, recommending installation of the powerline within the road grade fill at stream crossings would reduce temporary wetland impacts from the Proposed Action from 576 feet to 328 feet. Where feasible, installing the powerline using a cable plowing method or similar would further reduce temporary wetland impacts by reducing

the width of the disturbance corridor (PDC 12). Impact reduction would depend on the exact installation method and equipment.

7.2.2 INDIRECT WETLAND IMPACTS

Indirect impacts to wetlands potentially include the effects due to tree removal, wetland dewatering due to snowmaking line construction or grading, increased snow compaction, increased noxious weed invasion, and erosion and sedimentation. Direct and indirect impacts to surface water wetlands and streams is not expected to impact groundwater quality and quantity of area bedrock aquifers and is not addressed in this report.

Tree Removal

Of the 27.08 acres of Type 7 wetland within the Analysis Area, the Proposed Action would result in the indirect impact to 0.77 acres of Type 7, Hardwood and Coniferous Swamp wetlands. Of the 6,500 linear feet of streams within the Analysis Area, the proposed action would result in the indirect impact to 1,903 linear feet of streams from tree removal. Tree removal would occur in wetlands and streams from the Moose Mountain SUP and Eagle Mountain ski trails as well as the Moose Mountain Lift 3 egress.

The indirect impact from tree removal would cause a change in wetland vegetation composition and structure in the immediate area of tree removal. Impacts are expected to be greatest in areas cleared for ski trails where tree removal would be near 100%. In most cases where tree removal is proposed within wetlands and streams, the tree removal is only occurring in a very small portion of the plant community. The change in plant community within any one individual wetland would be very small and would not likely affect the wetland functions considerably. Functions such as velocity reduction, erosion protection, and water quality would likely be similar post tree removal as sedges, grasses and small shrubs that generally have deep binding root masses that slow the velocity of water, control erosion, and uptake sediments and nutrients replace the trees. Details regarding indirect impacts to wildlife species from tree removal is provided in the Biological Assessment/Biological Evaluation Report completed for this project.

Dewatering

Wetlands are sensitive to changes in hydrology. Wetlands supported by groundwater could be affected if there are changes in the pattern of groundwater flow into and through the wetland, or a reduction in the groundwater recharge area for a wetland. Changes to a wetland's hydrology could potentially reduce the size of the wetland, change its species composition, or lead to a conversion to another wetland type or to upland habitat.

The proposed grading and fill for the Moose Mountain base area road and parking would impact observed seeps that could potentially disrupt the subsurface hydrology that supports 7.21 acres (of a total 27.14 acres) of wetlands downgradient from the seep. Implementation of avoidance and minimization PDC 4, 6, and 8 recommending avoidance of observed groundwater seeps would eliminate the potential for dewatering 7.21 acres of wetland.

The installation of underground pipeline trenches for snowmaking through or adjacent to wetlands may intercept the high groundwater table or perched surface water and potentially cause a "French-drain" effect that could dewater the wetland so that it no longer is in a functioning condition. The Moose Mountain snowmaking pipeline has the potential to impact 0.57 acres of wetland based on an estimated 100-foot-wide effect zone. Although there is potential to drain wetlands through alterations in subsurface hydrology, groundwater patterns are unknown and impact calculations are estimations. Adverse effects to wetlands through alterations of groundwater or surface water flow may require additional mitigation measures to comply with the Forest Plan. Clay-cutoff walls or trench

breakers are recommended by federal agencies for pipeline construction. The Federal Energy Regulatory Commission (FERC) Office of Energy Projects recommends the use of trench breakers at wetland boundaries and/or trench bottoms to seal the trench to maintain the original wetland hydrology (FERC, 2013). It is unknown to what extent a pipeline trench will dewater a wetland or how effective a cut off wall will be in preventing dewatering. Implementation of avoidance and minimization PDC 11 recommending installation of clay-cut off walls (trench breakers) in any trench cut through wetland resources would reduce the potential for dewatering of 0.57 acres of wetland to <0.57 acres.

Snow Compaction

Snow compaction may also lead to changes in wetland function. Snow compaction would be greatest along any groomed ski trails. Regular use by skiers may also compact snow. Snow compaction can alter the thermal characteristics of soil, lowering surface soil temperatures and increasing frost depth (Wanek & Shumacher, 1975). These colder soil temperatures and deep freezing can negatively affect the survival of many plants including associated soil microorganisms and fungal mycorrhizae (Wanek, 1971 & 1973). Compacted snow also melts later than uncompacted snow, which leads to delayed flowering times, reduced seed set, and possibly long-term population viability of individual plant species. However, delayed snow melt may also provide extra soil moisture during the growing season which may benefit some plant species. The reduction in growing season length in wetlands with organic soil layers could potentially affect site carbon dynamics related to production and decomposition.

The effect of snow compaction on wetlands with deep layers of organic soils (fens) has recently been examined in the Routt National Forest (NF) and in Prospect Basin in Colorado. Researchers examined ecological response variables (soil temperature, plant production, snowpack persistence, and growing season length) in fens from moderate snow compaction due to Nordic skiing, snowmobiling, and mechanized grooming with soil temperature being the primary mechanism driving impacts. The results of snow compaction on soil temperatures were not statistically different from control points in the Routt NF. High intensity and frequent snow compaction from mechanized grooming did show a decrease in peat soil temperatures and a reduction in effective growing season length at Prospect Basin. The researchers attributed the difference in soil temperature response to the difference in snow depth and the intensity of the compaction. Measurable impacts to wetlands from snow compaction are most likely to occur where use is especially frequent or intensive (Gage and Cooper 2013). The Moose Mountain base area wetlands support organic rich soils in some areas, but were observed to be relatively shallow compared to the deep organic soils typically found in fens. Only 0.30 acres of the total 27.14 acres of wetlands are located within groomed ski trails and egress trails under the Proposed Action that would be susceptible to snow compaction.

Noxious Weed Invasion

Noxious weed invasion into wetlands can have an adverse effect on wetland quality and functional value. Tansy (*Tanacetum vulgare*) and Canada thistle (*Cirsium arvense*), are plant species on the Minnesota noxious weed control list. Tansy and Canada thistle were observed in developed areas of Lutsen Mountains along roads, parking lots, and snowmobile trails. Noxious weeds were not observed within the undeveloped Analysis Area. With proper implementation of the BMPs and PDC, such as prompt revegetation, monitoring for new invasive species three years' post construction, and cleaning construction equipment prior to being transported to the site, the threat of noxious weeds invading existing or temporarily disturbed wetlands would be reduced. Additional information on preventing the spread of noxious weeds and other non-native invasive species is provided in the Biological Assessment/Biological Evaluation Report completed for this project.

Erosion and Sedimentation

With any construction project, the threat of erosion and sedimentation affects to wetlands is present. However, with the implementation of the numerous BMPs and PDC listed in Section 10.0, these indirect impacts would be insignificant. Such protections generally include: avoiding wetland and riparian areas for snow storage or disposal, installing appropriate sediment control features prior to ground disturbing activities, constructing roads and trails so that they do not drain directly into wetlands, and identifying and flagging wetlands prior to construction.

To prevent any unintentional impacts, all wetlands near the proposed projects would be delineated and flagged by a qualified individual prior to construction. In addition, appropriate sediment control measures (e.g. straw wattles, silt fence) would be installed where necessary to contain sediment. Specific wetland impacts from the Proposed Action within the Moose Mountain Analysis Area are shown on Wetland Maps, M1 – M12 in **Appendix B**. Specific wetland impacts from the Proposed Action and the Resource Protection Alternative within the Eagle Mountain Analysis Area are shown on Wetland Maps, E1 and E2 in **Appendix C**. Specific stream impacts from the Proposed Action within the Moose Mountain and Eagle Mountain Analysis Area are shown on Stream Maps, S1 – S5 in **Appendix D**.

Rapid FQA Condition Category

The Rapid FQA is completed over an Assessment Area (AA) based on wetland plant community. Minor changes to the cover class of present species from activities such as wetland fill or tree removal will have little effect on the overall Rapid FQA Biological Condition Gradient (BCG). For example, the 0.77 acres of tree removal under the Proposed Action from the total 27.08 acres of Type 7 Hardwood and Coniferous Swamp wetland within the Analysis Area would not change Rapid FQA BCG since it is such a small percentage of the overall plant community. The BCG of the wetland plant communities within the Analysis Area are not expected to change because of the minor amounts of direct and indirect impacts under the Proposed Action.

Measurable changes to a plant communities BCG could result from long-term anthropogenic stressors from land use changes such as wetland dewatering. Implementation of avoidance and minimization PDC recommending avoidance of observed groundwater seeps and installation of clay-cut off walls (trench breakers) in any trench cut through wetland resources would minimize the potential for dewatering and changes to plant community BCGs.

EO 11990 Compliance

EO 11990 requires federal agencies to avoid to the extent practicable, long- and short-term adverse impacts associated with the destruction or modification of wetlands. BMP's and PDC have been identified to avoid and minimize impacts to wetlands including project-specific PDC such as; shifting or relocating roads and parking lots to avoid seeps, wetlands, and streams; spanning wetland resources where feasible; limiting the disturbance width of snowmaking lines and power lines; installing clay cutoff walls in any snowmaking or utility line trench within or adjacent to wetlands to avoid draining the subsurface hydrology and dewatering the wetland; leaving stumps and root wads intact within wetlands; and cleaning construction and logging equipment to prevent the spread of invasive species. The Proposed Action BMPs and PDC minimize and avoid impacts to wetlands in accordance with EO 11990.

7.3 ALTERNATIVE 3 – RESOURCE PROTECTION ALTERNATIVE

The direct and indirect impacts to wetlands and other waters of the U.S. that would result from Alternative 3 – Resource Protection Alternative would be very similar to the Proposed Action. Eagle Mountain project components, Moose Mountain base area (including parking and access road, snowmaking ponds, and stormwater ponds), Lifts 2 and 3, and the temporary mountain access roads would remain identical to the Proposed Action. The primary difference to wetland impacts are from the elimination of the projects from the northwest side of Moose Mountain and additional impacts from the Moose Mountain Lift 7 egress. PDC have been developed to further avoid and minimize impacts to wetlands. A full list of the BMPs and PDC are provided in Section 10.0 of this report. **Table 6** summarizes the wetland impacts from the Alternative 3. Stream impacts are identical to Alternative 2. **Table 6** also includes details on what the wetland and stream impacts would be if PDC were implemented for the proposed projects (shown in red text). The PDC number in **Table 6** correspond to the PDC numbers in **Table 8** in Section 10.0. Further details on the direct and indirect effects that differ from the Proposed Action are provided in the following sections. **Appendix E** contains detailed maps of the wetland resources and identifies the location of direct and indirect effects. The direct and indirect impacts are identified on the maps and in the tables by wetland impact number.

7.3.1 DIRECT WETLAND IMPACTS

Permanent Wetland Impacts

Of over 27 acres of wetland identified within the Analysis Area, Alternative 3 would result in 0.67 acres of permanent wetland impacts. Permanent impacts to Type 7, Hardwood and Coniferous Swamps in the Moose Mountain SUP would be reduced from those of the Proposed Action by 0.21 acres by eliminating the projects from northwest side of Moose Mountain. Remaining permanent wetland impacts would occur from fill and grading of the base area facilities (0.01 acres), base area roads and parking (0.49 acres), mountain roads (0.07 acres), and lift terminals (0.07 acres). Permanent impacts to Type 2, Sedge Meadow in the Eagle Mountain SUP would occur from fill and grading of the base area parking (0.02 acres) and the surface lift (0.003 acres).

Implementation of avoidance and minimization PDC would reduce permanent wetland impacts from the Alternative 3 from 0.67 acres to 0.28 acres. PDC that would reduce permanent wetland impacts include; spanning seeps and wetlands to avoid disrupting water supply or drainage patterns (PDC 4), redesigning or relocation parking lots to avoid seeps and wetlands (PDC 6), relocating Moose Mountain Road 3 (PDC 7), shifting Moose Mountain base area road 25 feet east (PDC8).

Permanent Stream Impacts

Permanent stream impacts remain the same as the Proposed Action.

Temporary Wetland Impacts

Temporary wetland impacts remain the same as the Proposed Action.

Temporary Stream Impacts

Temporary stream impacts remain the same as the Proposed Action.

7.3.2 INDIRECT WETLAND IMPACTS

Indirect impacts to wetlands that would result from Alternative 3 are the same as Alternative 2 except for changes to the location and acreage of tree removal. Indirect impacts to wetlands potentially include the effects due to tree removal, wetland dewatering due to snowmaking line construction or grading, increased snow compaction, increased noxious weed invasion, and erosion and sedimentation. However, with the implementation of construction BMPs and PDC, these indirect impacts would be insignificant.

Tree Removal

Of the 27.08 acres of Type 7 wetland within the Analysis Area, Alternative 3 would result in the indirect impact to 1.05 acres of Type 7, Hardwood and Coniferous Swamp wetlands from tree removal. Tree removal impacts would be reduced from the northwest side of Moose Mountain roads and lift terminals but would be increased by the addition of the Moose Mountain Lift 7 egress. The Moose Mountain Lift 7 egress would result in 0.34 acres of tree removal.

Dewatering

Dewatering impacts remain the same as the Proposed Action.

Snow Compaction

Snow compaction impacts remain the same as the Proposed Action.

Noxious Weed Invasion

Noxious Weed impacts remain the same as the Proposed Action.

Erosion and Sedimentation

Erosion and sedimentation impacts remain the same as the Proposed Action.

Specific wetland impacts from the Proposed Action and the Alternative 3 within the Eagle Mountain Analysis Area are shown on Wetland Maps, E1 and E2 in **Appendix C**. Specific wetland impacts from the Alternative 3 within the Moose Mountain Analysis Area are shown on Wetland Maps, M13 – M16 in **Appendix E**.

Rapid FQA Condition Category

Rapid FQA Condition Category impacts remain the same as the Proposed Action.

EO 11990 Compliance

EO 11990 Compliance remains the same as the Proposed Action.

Table 6: Wetland Impact Summary – Resource Protection Alternative

PROJECT NAME	WETLAND IMPACT NUMBER (Type) ³	PDC NUMBER APPLIED	DIRECT IMPACT		INDIRECT IMPACT	
			PERMANENT (ACRES)	TEMPORARY (ACRES)	TREE REMOVAL (ACRES)	DEWATERING (ACRES)
MOOSE MOUNTAIN						
Moose Base Facilities	W11l, W11k (Type 7)	-	0.01	-	-	-
Moose Mtn Base Area Roads and Parking	W11j, W11o, W11n, W12a, W14d, W14e, W14f, W14g, W14h, W14i, W14n, W15a, W15b, W21a, W22a, W23a (Type 7)	4, 6, 8	0.49 0.18	-	-	7.21 0.00
Moose Mtn Mountain Roads	W14c (Type 7)	7	0.07 0.00	-	-	-
Moose Mtn Snowmaking Line	W3a, W4a, W4b, W9a, W11m, W14j, W14k (Type 7)	11	-	0.15	-	0.57 0.00
Moose Mtn Powerline	W11f, W11g, W11h, W11i, W22b (Type 7)	13	-	0.18 0.11	-	-
Moose Mtn Lift 3 Egress	W6b (Type 7)	-	-	-	0.01	-
Moose Mtn Lift 7 Egress	W14l, W14m, W14n, W15a, W16a, W17a, W17b, W18a, W18b, W18c, W19a, W20a (Type 7)	-	-	-	0.34	
Moose Mtn Ski Trails	W6a, W11a, W11b, W11c, W14a, W14b (Type 7)	-	-	-	0.23	-
Moose Mtn Lift Terminals	W1b, W2b, W11d, W11e (Type 7)	-	0.07	-	-	-
Subtotal without PDC	-	-	0.65	0.33	0.57	7.78
Subtotal with PDC	-	-	0.26	0.26		0.00
EAGLE MOUNTAIN						
Eagle Mtn Base Area Parking	W25a (Type 2)	-	0.02	-	-	-
Eagle Mtn Ski Trails	W24a, W27a, W27b (Type 7)	-	-	-	0.48	-
Eagle Mtn Surface Lift	W26a (Type 2)	-	0.003	-	-	-
Subtotal	-	-	0.02	-	0.48	-
Total without PDC (% of Total Wetlands)	-	-	0.67 (2.5%)	0.33 (1.2%)	1.05 (3.9%)	7.78 (28.7%)
Total with PDC (% of Total Wetlands)	-	-	0.28 (1.0%)	0.26 (1.0%)		0.00

¹ Wetland impact number corresponds to wetland impacts identified on the Wetland Maps in Appendix E.

² PDC number corresponds to the PDC numbers in Table 8 in Section 10.0.

³ All wetland impacts are Type 7, Wooded Swamps except for wetland impact number W25a and W26a which are Type 2, Sedge Meadows
Red text identified the proposed impact if the recommended PDC is implemented for the proposed projects.

8 CUMULATIVE EFFECTS

Cumulative effects to wetlands result from the combined impact of past, present, and reasonably foreseeable future. Under NEPA, cumulative effects are the result of the incremental direct and indirect effects of any action when added to other past, present, and reasonably foreseeable future actions, and can result from individually minor but collectively major actions taking place over a period of time (40 CFR 1508.7).

8.1 SCOPE OF THE ANALYSIS

The temporal bounds for this cumulative effects analysis for wetland resources extends from LMC's inception as a resort in 1948, through the next 25 years in which LMC can be expected to operate. The spatial bounds for this cumulative effects analysis are limited to the 6th level watershed: the City of Tofte-Frontal Lake Superior watershed (HUC12 040101011302) and the City of Lutsen-Frontal Lake Superior watershed (HUC12 040101011301). Cumulative effects discussion of the Analysis Area watersheds is provided in the Hydrology Report being completed for this project.

8.2 PAST, PRESENT AND REASONABLY FORESEEABLE FUTURE PROJECTS

Past, present and reasonably foreseeable future actions that have cumulatively affected, and that will likely cumulatively affect, wetland resources within the Analysis Area are related to development and land use of public and private lands. A brief list of projects related to wetland resources is provided below. Refer to the EIS associated with this project for a complete list of all Cumulative Effects projects.

- Lutsen Mountains Ski Resort Projects
 - Lutsen Mountains 2016 Master Development Plan
 - Previously completed ski area upgrades on private land since 1948
-

8.2.1 ALTERNATIVE 1 – NO ACTION

Historically, ski areas such as LMC have likely impacted wetlands especially prior to implementation of the 1972 CWA. In addition, past disturbances to wetlands have likely occurred both within the LMC SUP area as well as rpl6th level watersheds. Project watersheds have adapted to these changes, as indicated by the results of the wetland RFQA.

As previously discussed, some minor indirect impacts to wetlands are likely occurring within project watersheds because of ongoing ski area operations (i.e. tree removal, snow compaction, increased hydrologic budgets from snowmaking), and under the No Action Alternative cumulative effects to wetlands would continue to occur.

Current monitoring appears to indicate no long-term impacts to wetlands from the cumulative effects of past activities. Considering the existing laws protecting wetlands on both private and federal lands, cumulative impacts to wetlands in the future are likely to be relatively minor.

8.2.2 ALTERNATIVE 2 – PROPOSED ACTION

Cumulative effects for Alternative 2 would be generally similar to those described for Alternative 1; however, the magnitude would be greater under the Proposed Action as there is a potential direct impact to 1.21 acres of wetlands through permanent and temporary disturbances. In addition, another 0.77 acres of wetlands may be indirectly affected by the Proposed Action through tree removal, and 7.78 acres may potentially be affected through dewatering or changes in hydrologic regime from adjacent grading and snowmaking pipeline construction. Impacts of the Proposed Action at the 6th level watershed would increase the acreage of upland openings by approximately 0.2% for the City of Lutsen-Frontal Lake Superior watershed and 1.2% for the City of Tofte-Frontal Lake Superior watershed. The percent of upland openings would remain well below the 60% threshold set forth by the Forest Plan (LRE, 2021).

The total acres of wetland within the 6th level watersheds and the study watersheds have not been field verified but were calculated based on the NWI. The percent of wetlands potentially impacted by the Proposed Action per watershed is listed in **Table 7**.

Table 7: Percent of Wetland Potentially Impacted per Watershed

Watershed	Total Acres of NWI Wetlands	Acres of Direct/Indirect Impacts	% of Watershed Impacted
City of Tofte-Frontal Lake Superior	2,087.54	9.27	0.44%
City of Lutsen-Frontal Lake Superior	2,589.90	0.5	0.02%
Moose Mtn-Frontal Lake Superior	212.30	8.99	4.23%
Eagle Mtn-Frontal Lake Superior	91.00	0.5	0.55%
Upper Rollins Creek	275.40	0.28	0.10%

Aside from the Proposed Action, there are no other known impacts to wetlands within the 6th level watersheds or the study watersheds of Moose Mtn-Frontal Lake Superior, Eagle Mtn-Frontal Lake Superior, and Upper Rollins Creek. A detailed description of the impacts to watershed health, watershed yield, hydrologic connectivity, water quality, and geomorphology of the Analysis Area watersheds is provided in the Lutsen Mountains Ski Area Expansion Project Hydrology Report (LRE Water, 2020).

8.2.3 ALTERNATIVE 3 – RESOURCE PROTECTION ALTERNATIVE

Cumulative effects for Alternative 3 would be generally similar to those described for Alternative 1; however, the magnitude would be greater under Alternative 3 as there is a potential direct impact to 0.93 acres of wetlands through permanent and temporary disturbances. In addition, another 1.05 acres of wetlands may be indirectly affected by the Alternative 3 through tree removal, and 7.78 acres may potentially be affected through dewatering or changes in hydrologic regime from adjacent grading and snowmaking pipeline construction. Impacts of the Alternative 3 projects at the 6th level watershed would increase the acreage of upland openings by approximately 0.2% for the City of Lutsen-Frontal Lake Superior watershed and 1.1% for the City of Tofte-Frontal Lake Superior watershed. The percent of upland openings would remain well below the 60% threshold set forth by Forest Plan (LRE, 2021). The percent of wetlands potentially impacted by Alternative 3 per watershed is very similar to those listed in **Table 7**.

9 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The 0.88 acres of permanent wetland impact and 929 feet of permanent stream impacts resulting from Moose Mountain and Eagle Mountain SUP projects are considered an irreversible commitment of wetland resources for the Analysis Area. PDC would reduce permanent wetland impacts from 0.88 acres to 0.47 acres. Additional PDC may be developed to further reduce permanent wetland impacts. Mitigation measures through the CWA 404 permitting process and Forest Service consultation would result in no net irreversible loss of wetlands. Final compensatory mitigation will be coordinated with the USACE on federal lands and the USACE/WCA local governing unit on private lands.

The 0.33 acres of temporary wetland impact and 576 feet of temporary stream impacts is considered an irretrievable commitment of wetland resources and would likely last for approximately three to five years or until the disturbed wetlands are fully restored to their pre-disturbance condition.

Any indirect impacts due to forest tree removal, wetland dewatering, snow compaction, noxious weed invasion, and erosion and sedimentation would be minimized with PDC.

9.1 BEST MANAGEMENT PRACTICES AND PROJECT DESIGN CRITERIA

The Proposed Action and Resource Protection Alternative incorporate BMPs and PDC that would be implemented for any approved projects. These BMPs and PDC are developed to reduce environmental impacts and comply with applicable laws and regulations. The BMPs and PDC applicable to wetlands are listed in **Table 8** and **Table 9**.

Table 8: BMPs Applicable to Wetlands

BEST MANAGEMENT PRACTICES
Non-natives/revegetation
Re-seeding/revegetation plans need to be developed, discussed, and implemented with the Forest Service Botanist. Create a revegetation plan that includes measures to adequately establish desirable vegetation.
Limit the spread of invasive plant species in the project area.
Monitor for and treat any new invasive botanical species for a minimum of three years after project completion.
Erosion protection
Maintain vegetative buffers adjacent to intermittent or ephemeral drainages and all wetlands. Buffer sizes would be developed in coordination with the Forest Service hydrologist.
Remove minimum area of wetland vegetation required to complete project objectives. Cut vegetation just above ground level, leaving existing root systems in-place.
Reclaim disturbed areas promptly after construction to prevent erosion and invasion by weeds. Ensure proper drainage, loosen compacted areas, apply biodegradable erosion control blanket or mulch, and apply a Forest Service-approved seed mix to facilitate revegetation. Incorporate native vegetation into site plans as much as possible.
Do not encroach fills or introduce soil into streams, wetlands, or riparian areas. Protect these features from sediment by installing sediment waddles, sediment fencing, retention basins, or other applications as appropriate before ground-disturbing activities begin.

Roads
During winter operations, maintain roads as needed to keep the road surface drained during thaws and break-ups. Do not use salt for ice melting and use sand sparingly if ice mitigation is required. Perform snow removal in such a manner that protects the road and other adjacent resources. Do not use riparian areas, wetlands or streams for snow storage or disposal. Remove snow berms where they result in accumulation or concentration of snowmelt runoff on the road or erodible fill slopes. Install snow berms where such placement will preclude concentration of snowmelt runoff and will serve to rapidly dissipate melt water.
Construct roads and other disturbed sites to minimize sediment discharge into streams, wetlands, and other riparian areas. Reduce sediment sources and connected disturbed areas by minimizing the number of stream crossings. Construct trail approaches to stream crossings such that drainage is relieved onto the hill slopes, as opposed to entering the channel.
Keep roads and trails out of wetlands unless there is no other practicable alternative and after review by Forest Service, Army Corps, or Board of Soil and Water Resources personnel, as appropriate. If roads or trails must enter wetlands, use spans or similar engineering solution to sustain flow patterns. Avoid actions that may dewater or disrupt hydrology in streams and wetlands.
Construction
Keep heavy equipment out of streams, swales, and wetlands, except to cross at Forest Service approved and designated points, where sufficient protection is provided. Exception may occur for performing restoration work or to build crossings, with Forest Service Soil Scientist, Hydrologist, and Fish Biologist approval. For approved temporary stream or wetland crossings, lay down construction mats or other physical barriers to protect against soil displacement and minimize the number of passes.
Keep all debris generated by project activities out of intermittent, and ephemeral streams, wetlands, and rare plant occurrences.
Evaluate activities for potential impacts to surface and subsurface flow. Avoid (or minimize, as appropriate) site-specific changes that may result in stream or wetland dewatering or flow accumulation into new areas that may result in unexpected erosion.
Any identified wetland will be completely avoided unless designed to minimize the area of effect and approved by the Forest Service, CWA 404 permit, and WCA permit where applicable.
Obtain any necessary CWA 401, 402, and 404 permits and WCA permits prior to project implementation.

Table 9: PDC Applicable to Wetlands

PDC NUMBER	PROJECT DESIGN CRITERIA
1	Wetlands near the potentially disturbed areas will be identified and flagged prior to the initiation of approved construction-related activities. Construction limits will be clearly defined.
2	Within ski trails, avoid grading and limit to tree removal only within wetlands and streams. Leave tree root systems in-place where feasible. Lift towers and footings would be located outside delineated wetlands
3	Avoid disrupting water supply or drainage patterns into wetlands. If this is not possible, obtain Forest Service Hydrologist's approval before implementation of disturbance and provide mitigation measures.
4	Span seep/wetland or provide an engineering solution that avoids disrupting water supply or drainage patterns into wetlands. Corresponding Wetland Impact Numbers: W11n, W11o, W14f, W14e, W14n, W15b, W21a, W22a
5	Span stream or use appropriately sized culvert. Corresponding Stream Impact Numbers: S6, S12, S16, S17, S19, S21
6	Redesign/reduce parking to avoid seep/wetland/stream impact. Corresponding Wetland and Stream Impact Numbers: W12a, W14d, W15a, S11
7	Relocate Moose Mountain Road 3 and Road 6 to avoid wetland/stream impact. Corresponding Wetland and Stream Impact Numbers: W2c, W14c, S2.
8	Shift Moose Mountain base area road 25 feet to the east. Corresponding Wetland Impact Numbers: W14i
9	Where unavoidable direct impacts to streams occur, relocate stream channel to maintain water supply and drainage patterns. Obtain Forest Service Hydrologist's approval before implementation of disturbance and provide mitigation measures.
10	To the greatest extent possible, the disturbance width for temporary snowmaking and other utility lines would be a maximum of 20 feet wide through wetlands and other waters of the U.S..
11	Prevent the proposed snowmaking and drainage pipelines from dewatering wetlands, clay-cutoff walls or a similar type structure (trench breaker) will be installed in the pipeline trench. Such cutoff walls shall be installed where the excavated pipeline trench encounters wetlands. Corresponding Wetland Impact Numbers: W3a, W4a, W4b, W9a, W11m, W14j, W14k.
12	Where feasible, install power utility lines via cable plowing method to minimize disturbance to the landscape.
13	Where feasible, install powerline within road grade fill at wetland/stream crossing. Corresponding Wetland and Stream Impact Numbers: W22b, S18, S20, S22
14	Elevate the Superior Hiking Trail with a boardwalk through wetland. Corresponding Wetland Impact Numbers: W1a
15	Flush-cut and leave stumps and root wads intact within riparian areas and wetlands, except in areas identified for grading activities.
16	Clean construction and logging equipment prior to being transported to the site. Equipment should be cleaned between use in the Moose Mountain project area and the Eagle Mountain project area. This will reduce the threat of spreading noxious and invasive weed species into relatively unaffected areas.
17	Wetland mitigation to offset wetland impacts and ensure compliance with EO 11990 may be required.

10 SUMMARY OF WETLAND AND WATERS OF THE U.S. EFFECTS

Based on the results of public scoping, specific areas of concern have been identified and classified as *issues*. *Issues* may warrant the generation of an alternative, can be addressed by project design criteria or mitigation, or generally require in-depth analysis and disclosure. Each *issue* includes a list of indicators which were identified as a means of measuring or quantifying the anticipated level of impact on a particular resource. While some indicators are necessarily qualitative in nature, every effort was made to utilize indicators that are quantitative, measurable and predictable. **Table 10** provides a summary of the effects of Alternative 1 - No Action, Alternative 2 - Proposed Action, and Alternative 3 – Resource Protection Alternative on wetland resources of the Analysis Area. The summary of effects is organized by the *issue* and indicator.

Table 10: Summary of Wetland Effects by Issue and Indicator

Analysis Area: Approximately 715 acres affected by proposed projects within the Moose Mountain and Eagle Mountain SUP areas and adjacent private lands.			
Issue: Identified wetlands and other waters of the U.S. throughout the project area could be temporarily and/or permanently affected by construction and implementation of proposed projects.			
Indicator: Area of wetlands and other waters of the U.S. within the project area (acres/linear feet)			
Summary of existing wetland resources within the Analysis Area			
<u>Wetland Type</u>	<u>Area (Acres)</u>	<u>Stream Type</u>	<u>Length (Linear Feet)</u>
Type 7; Hardwood Swamp	15.56	Intermittent	3,969
Type 7; Coniferous Swamp	11.59	Ephemeral	2,590
Type 2; Sedge Meadow	0.06		
Total	27.14		6,519

Table 10: Summary of Wetland Effects by Issue and Indicator (continued)

Indicator: Disclosure of wetland functions and values within the project area		
Wetland	Rapid FQA Condition Category	
Moose Mountain SUP, Wetland 1 and Wetland 2	Exceptional (1): Community composition and structure as they exist (or likely existed) in the absence of measurable effects of anthropogenic stressors representing pre-European settlement conditions. Non-native taxa may be present at very low abundance and not causing displacement of native taxa.	
Moose Mountain SUP, Wetland 3 – 23	Exceptional (1): Community composition and structure as they exist (or likely existed) in the absence of measurable effects of anthropogenic stressors representing pre-European settlement conditions. Non-native taxa may be present at very low abundance and not causing displacement of native taxa.	
Eagle Mountain SUP, Wetlands 24 – 27	Fair (3): Moderate changes in community structure. Sensitive taxa are replaced as the abundance distribution shifts towards more tolerant taxa. Extent of expected native composition for the community type diminished.	
Indicator: Narrative description of wetland communities, classifications and disclosure of anticipated temporary and/or permanent impacts (acres/linear feet)		
Alternative 1 – No Action	Alternative 2 – Proposed Action	Alternative 3 – Resource Protection Alternative
Under the No Action Alternative, there would be a continuation of existing management practices without changes, additions, or upgrades. The SUP permit application for LMC would not be approved and no additional roads, buildings, parking lots, lifts, trails and associated snowmaking, or recreation opportunities would be constructed on NFS lands. Under the No Action Alternative no additional direct or indirect impacts to wetland resources would occur. The effects of snowmaking on the existing Moose Mountain and Eagle Mountain ski terrain would continue to increase the hydrologic budget in those areas. No other effects under the No Action Alternative are anticipated.	The anticipated direct and indirect impacts from Alternative 2 are quantified in Section 7. With implementation of BMPs and PDC, including wetland mitigation and/or restoration, these effects would not jeopardize the wetland functioning condition. Indirect effects to wetland resources include tree removal, wetland dewatering, snow compaction, noxious weed invasion and erosion and sedimentation. The text of this report describes potential changes to wetland structure, species composition, and function that could potentially occur. However, with implementation of the BMPs and PDCs, these changes would not be of sufficient magnitude or scale to cause a considerable effect.	The anticipated direct and indirect impacts from Alternative 3 are quantified in Section 7 and are essentially the same as Alternative 2 with minor changes to tree removal. With implementation of BMPs and PDC, including wetland mitigation and/or restoration, these effects would not jeopardize the wetland functioning condition. Indirect effects to wetland resources include tree removal, wetland dewatering, snow compaction, noxious weed invasion and erosion and sedimentation. The text of this report describes potential changes to wetland structure, species composition, and function that could potentially occur. However, with implementation of the BMPs and PDCs, these changes would not be of sufficient magnitude or scale to cause a considerable effect.

Table 10: Summary of Wetland Effects by Issue and Indicator (continued)

Indicator: Description of compliance with EO 11990, Protection of Wetlands		
Alternative 1 – No Action	Alternative 2 – Proposed Action	Alternative 3 – Resource Protection Alternative
Under the existing condition, the area is in compliance with EO 11990.	In accordance with EO 11990, the Proposed Action was designed to avoid and minimize impacts to wetlands wherever possible. BMP's and PDC have been identified to further avoid and minimize impacts to wetlands including project-specific PDC such as shifting or relocating roads and parking lots to avoid seeps, wetlands, and streams, spanning wetland resources where feasible, limiting the disturbance width of snowmaking lines and power lines, installing clay cutoff walls in any snowmaking or utility line trench within or adjacent to wetlands to avoid draining the subsurface hydrology and dewatering the wetland, leaving stumps and root wads intact within wetlands, and cleaning construction and logging equipment to prevent the spread of invasive species.	In accordance with EO 11990, the Proposed Action was designed to avoid and minimize impacts to wetlands wherever possible. BMP's and PDC have been identified to further avoid and minimize impacts to wetlands including project-specific PDC such as shifting or relocating roads and parking lots to avoid seeps, wetlands, and streams, spanning wetland resources where feasible, limiting the disturbance width of snowmaking lines and power lines, installing clay cutoff walls in any snowmaking or utility line trench within or adjacent to wetlands to avoid draining the subsurface hydrology and dewatering the wetland, leaving stumps and root wads intact within wetlands, and cleaning construction and logging equipment to prevent the spread of invasive species.
Indicator: Discussion of compliance with the Minnesota Forest Resource Council and 2004 Forest Plan standards regarding seasonal ponds		
Alternative 1 – No Action	Alternative 2 – Proposed Action	Alternative 3 – Resource Protection Alternative
Not applicable.	Wetland resource surveys were completed for waters of the U.S. including seasonal ponds during the 2017 and 2020 growing seasons throughout the Analysis Area. No seasonal ponds were observed.	Wetland resource surveys were completed for waters of the U.S. including seasonal ponds during the 2017 and 2020 growing seasons throughout the Analysis Area. No seasonal ponds were observed.

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FIGURES



APPENDIX

A

SE GROUP FIGURES

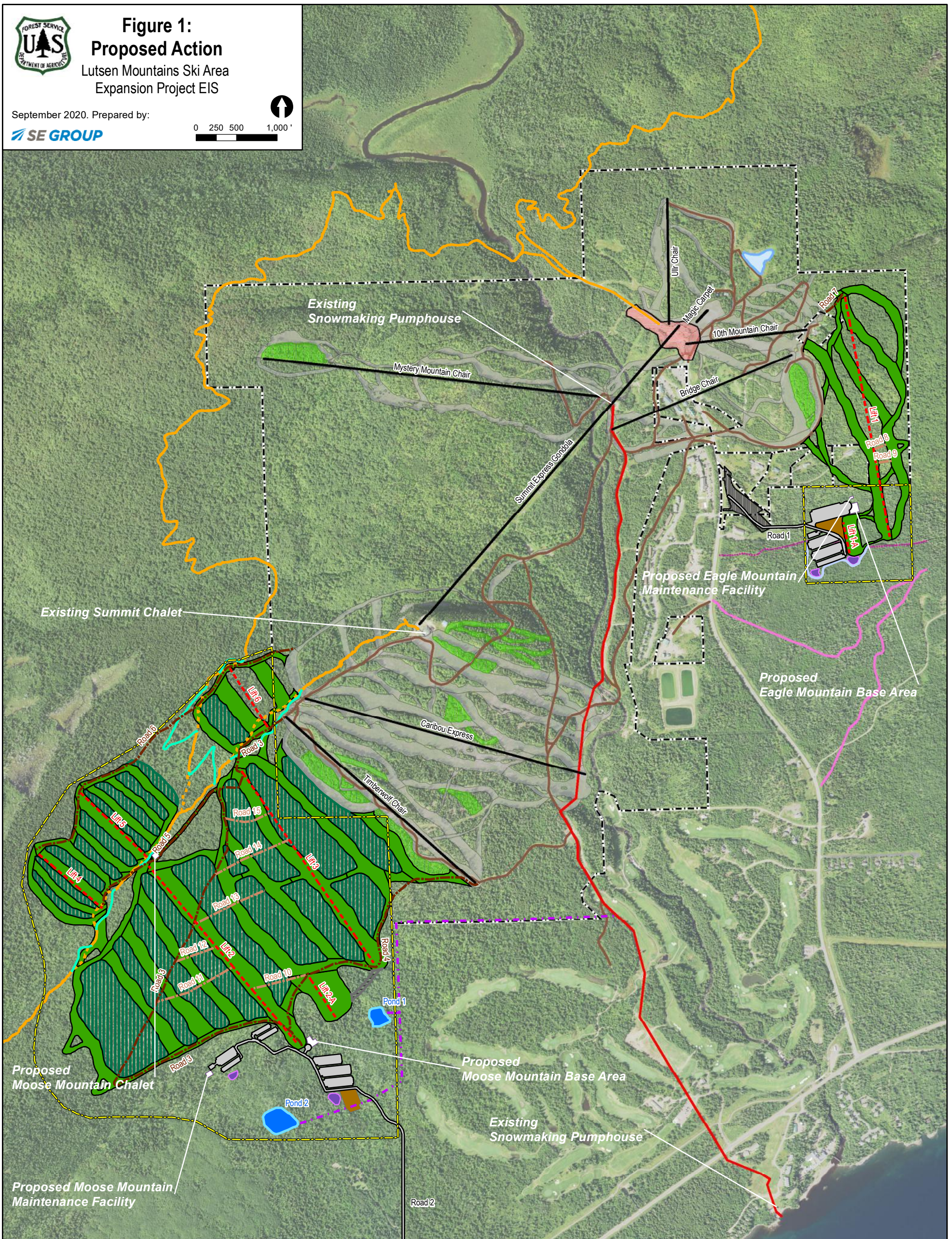


Figure 1:
Proposed Action
Lutsen Mountains Ski Area
Expansion Project EIS

September 2020. Prepared by:

SE GROUP

0 250 500 1,000'



Existing

- | | | | |
|--|-----------------------|--|-----------------------------|
| | Lifts | | Main Snowmaking Line |
| | Trails | | Snowmaking Ponds |
| | Glades | | Nordic Trails |
| | Base Area | | Snowmobile Trail |
| | Day Skier Parking | | Superior Hiking Trail (SHT) |
| | Mountain Access Roads | | SHT Segment to be Realigned |
| | | | Property Boundaries |

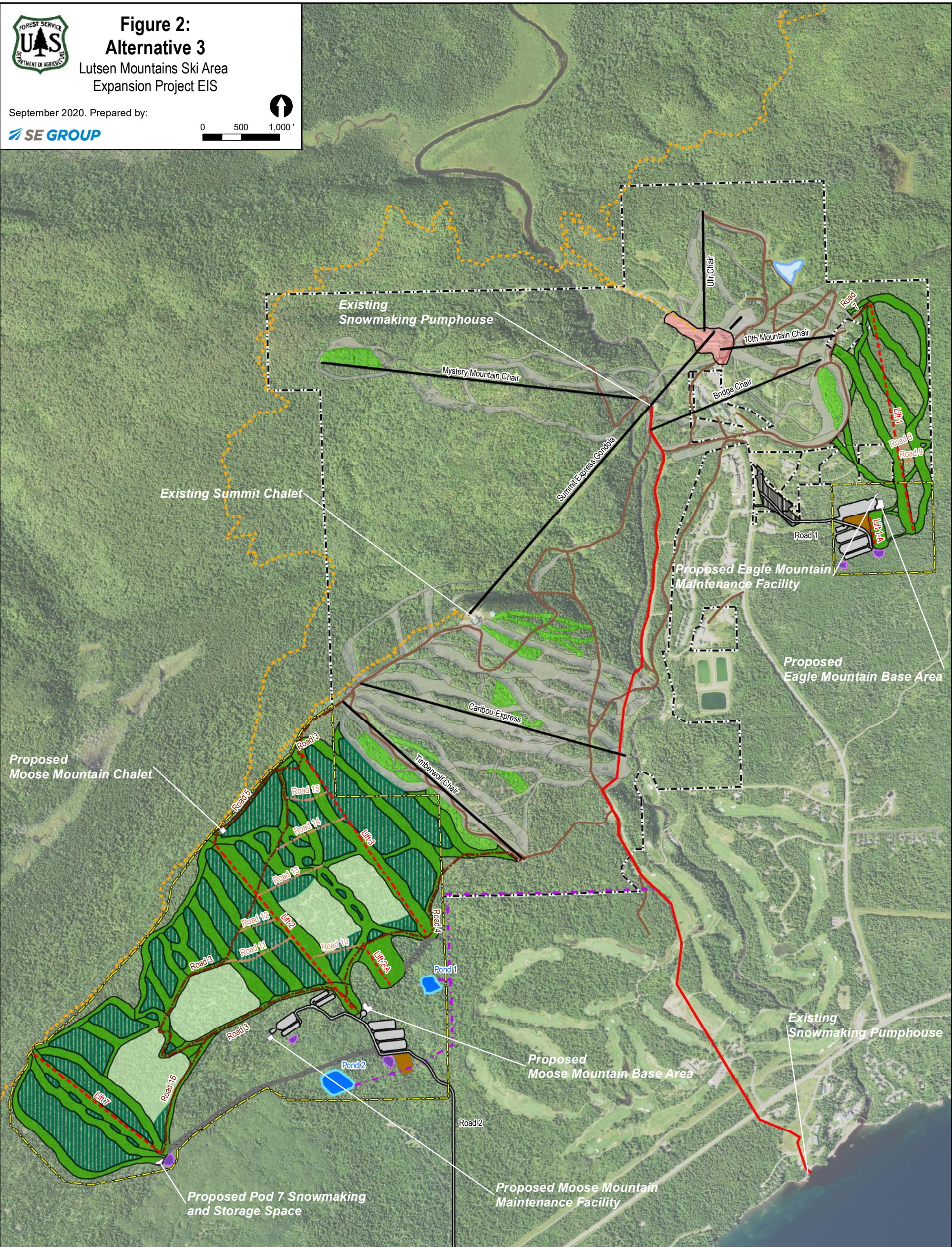
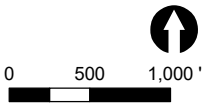
Proposed

- | | | | | | |
|--|------------------------|--|---------------------------------|--|-------------------------------|
| | Lifts | | Mountain Access Roads | | Snowmobile Trail Realignment |
| | Ski Trails | | Temporary Mountain Access Roads | | Realigned SHT Segment |
| | Glades | | Snowmaking Line | | Drainfields |
| | Facilities | | Snowmaking Pond | | Emergency Lift 3 Egress Route |
| | Parking Lots and Roads | | Stormwater Pond | | SUP Boundary |



**Figure 2:
Alternative 3**
Lutsen Mountains Ski Area
Expansion Project EIS

September 2020. Prepared by:



- Existing**
- Lifts
 - Trails
 - Glades
 - Base Area
 - Day Skier Parking
 - Mountain Access Roads

- Main Snowmaking Line
- Snowmaking Ponds
- Existing SHT
- Property Boundaries

- Proposed**
- Lifts
 - Ski Trails
 - Glades
 - Legacy Patches
 - Facilities
 - Parking Lots and Roads

- Mountain Access Roads
- Temporary Mountain Access Roads
- Snowmaking Line
- Snowmaking Pond
- Stormwater Pond

- Drainfields
- Access/Egress Routes
- SUP Boundary




APPENDIX

B

















MOOSE MOUNTAIN WETLAND
MAPS – ALTERNATIVE 2

Legend





GIS layers generated by SE GROUP

-  SUP Boundary
-  Private Boundary
-  Existing Superior Hiking Trail (SHT)




Proposed Projects

-  Mountain Access Roads
-  Lifts
-  SHT Realignment
-  Snowmobile Trail Realignment
-  Temporary Mtn Access Roads
-  Snowmaking Line
-  Power Line
-  Base Area Drainfields
-  Base Area Facilities
-  Base Area Roads and Parking
-  Glades
-  Lift Egress Tree Cutting
-  Ski Trails
-  Legacy Patches
-  Lift 7 Stormwater Pond
-  Snowmaking and Stormwater Ponds






GIS layers generated by WSP

-  Wetlands
-  Ephemeral Stream
-  Intermittent Stream
-  Seep

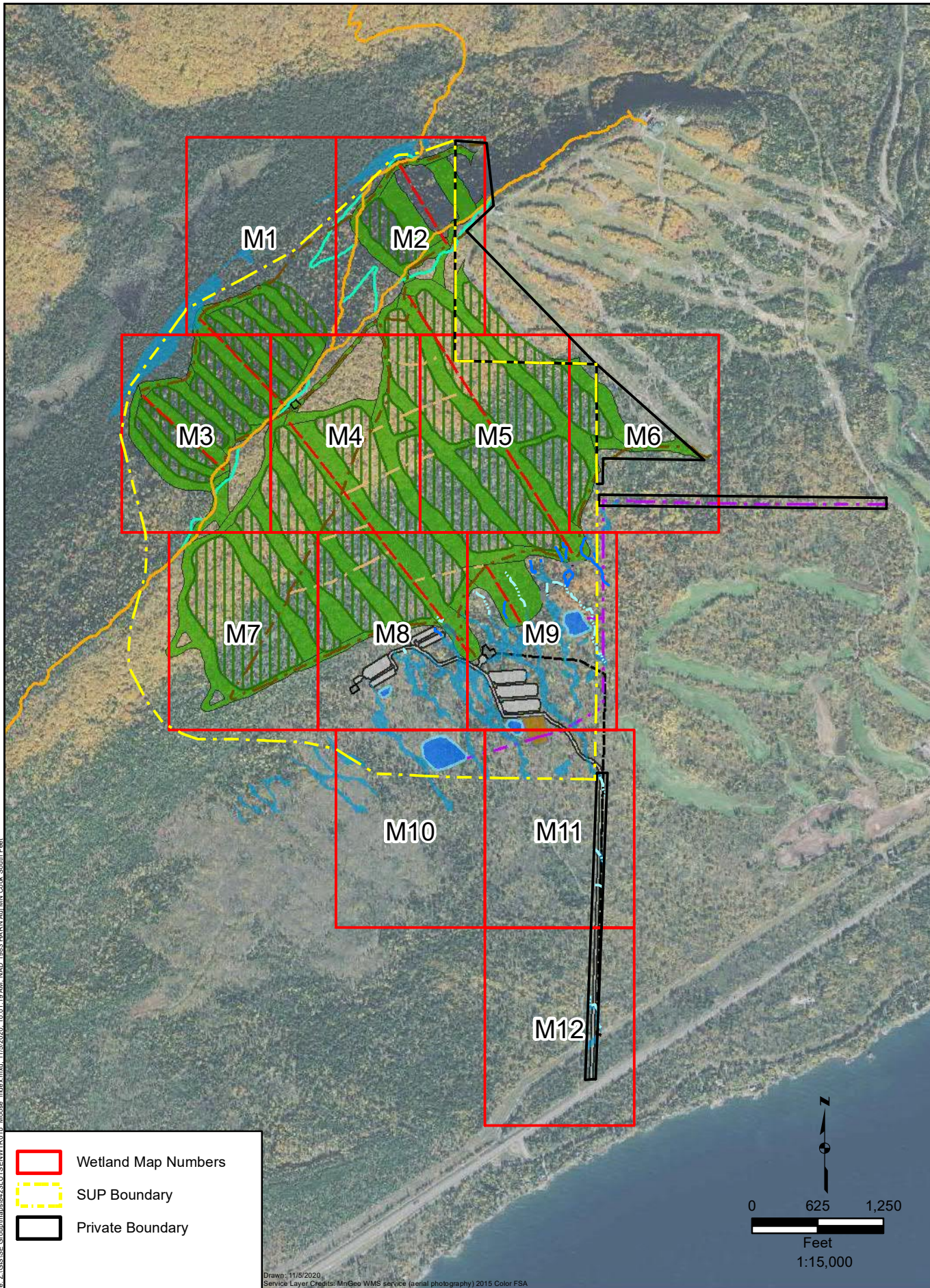
Stream Impact Type




-  Direct - Permanent
-  Direct - Temporary
-  Indirect - Tree Removal

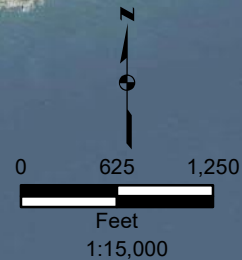
Wetland Impact Type

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-  Direct - Temporary
-  Indirect - Trail
-  Indirect - Tree Removal
-  Indirect - Dewatering

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-  Wetland Map Numbers
-  SUP Boundary
-  Private Boundary



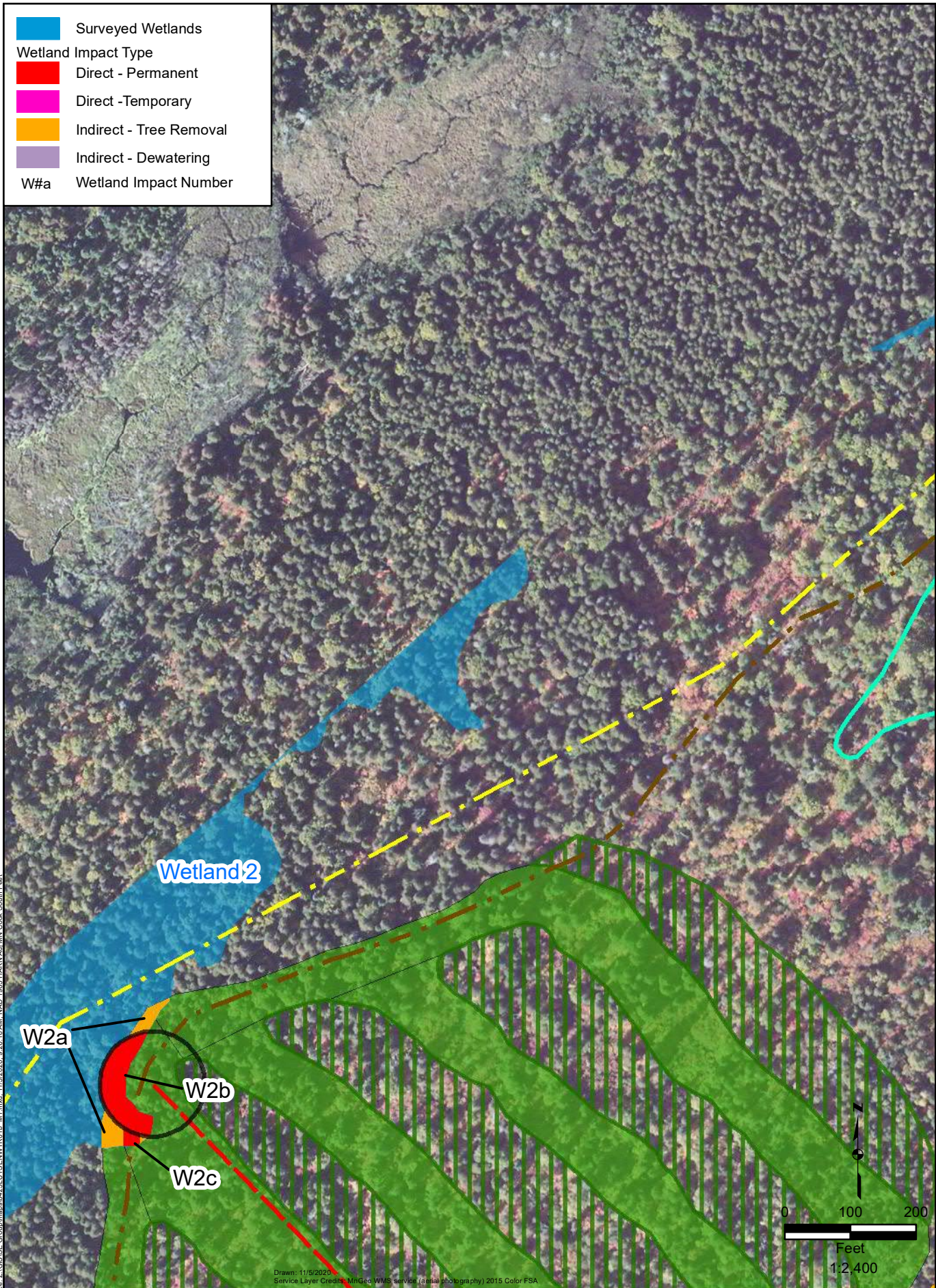
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WETLAND MAP INDEX

MOOSE MOUNTAIN SUP
ALTERNATIVE 2 - PROPOSED ACTION

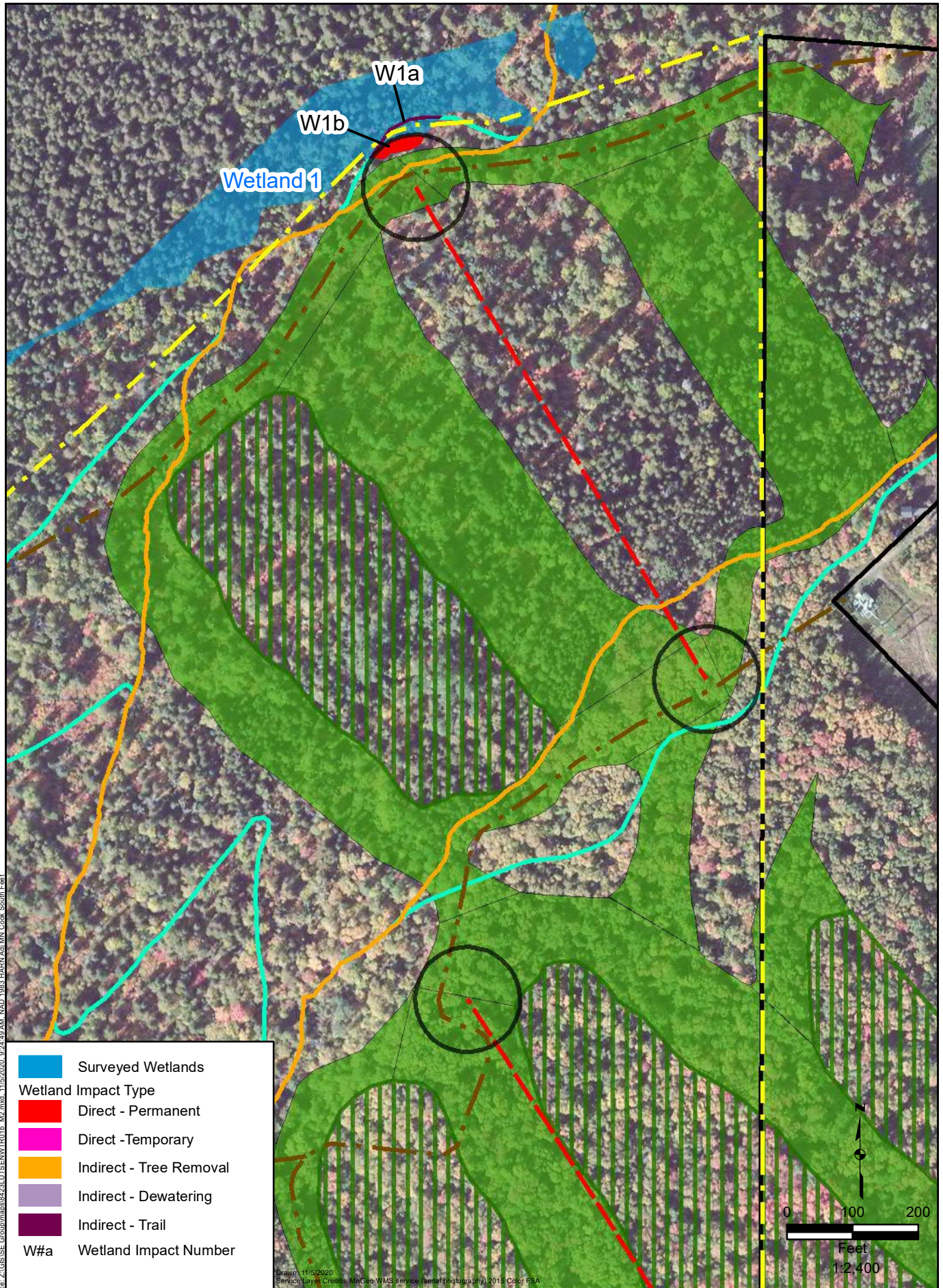


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WETLAND MAP - M1
MOOSE MOUNTAIN SUP ALTERNATIVE 2 - PROPOSED ACTION



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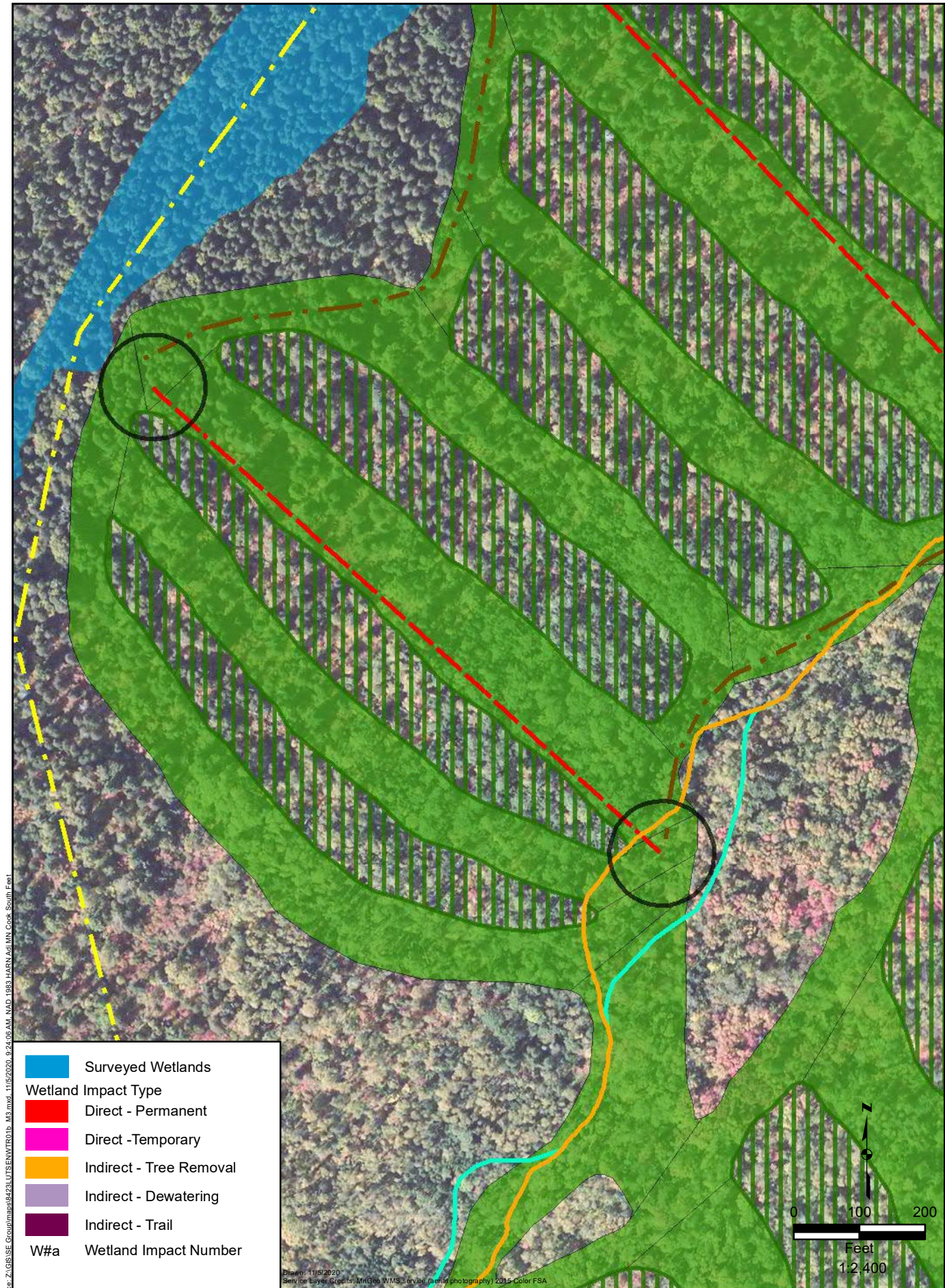


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WETLAND MAP - M2

MOOSE MOUNTAIN SUP
ALTERNATIVE 2 - PROPOSED ACTION



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WETLAND MAP - M4

MOOSE MOUNTAIN SUP
ALTERNATIVE 2 - PROPOSED ACTION

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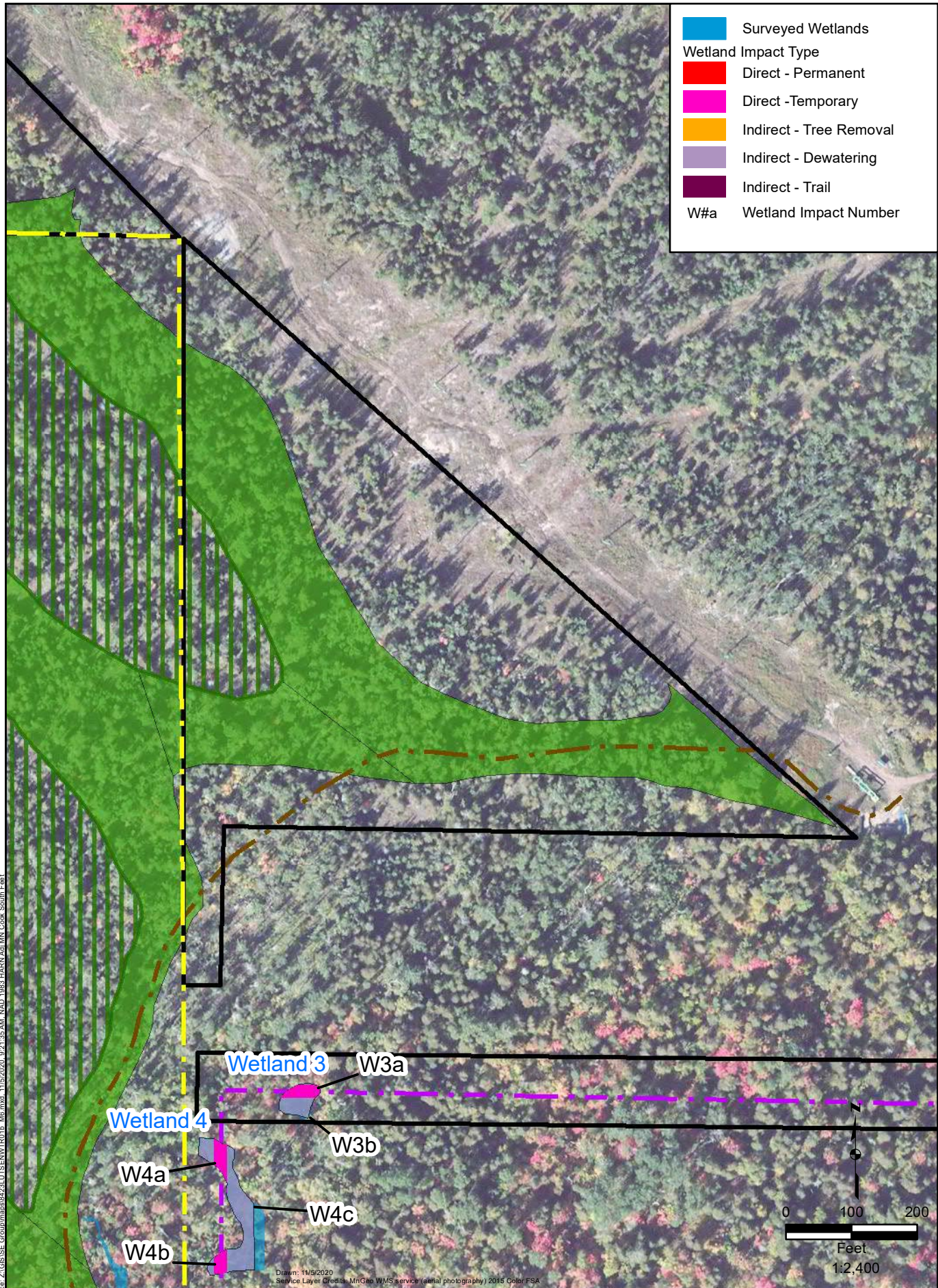
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WETLAND MAP - M5

MOOSE MOUNTAIN SUP
ALTERNATIVE 2 - PROPOSED ACTION



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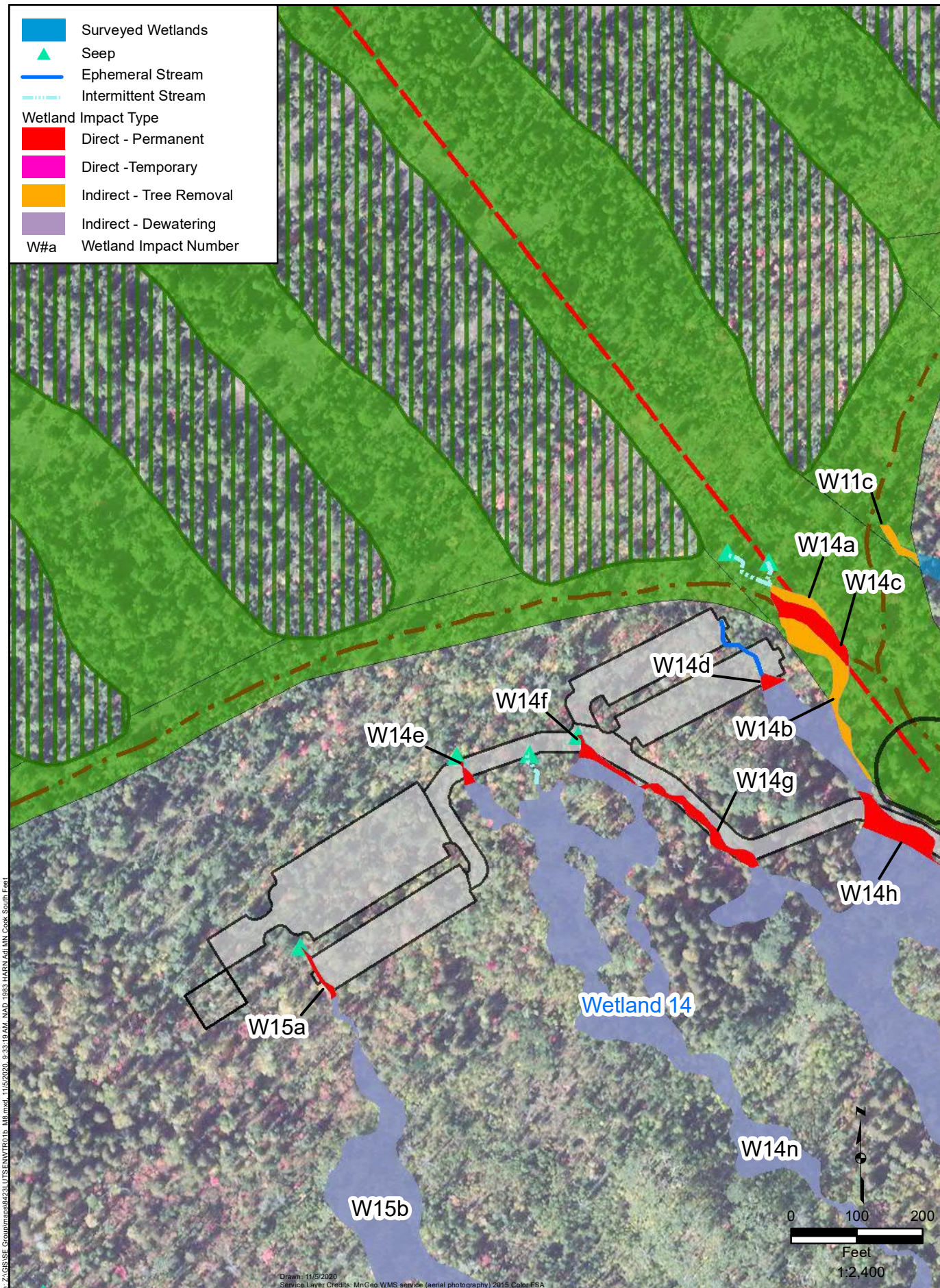
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WETLAND MAP - M6

MOOSE MOUNTAIN SUP
ALTERNATIVE 2 - PROPOSED ACTION



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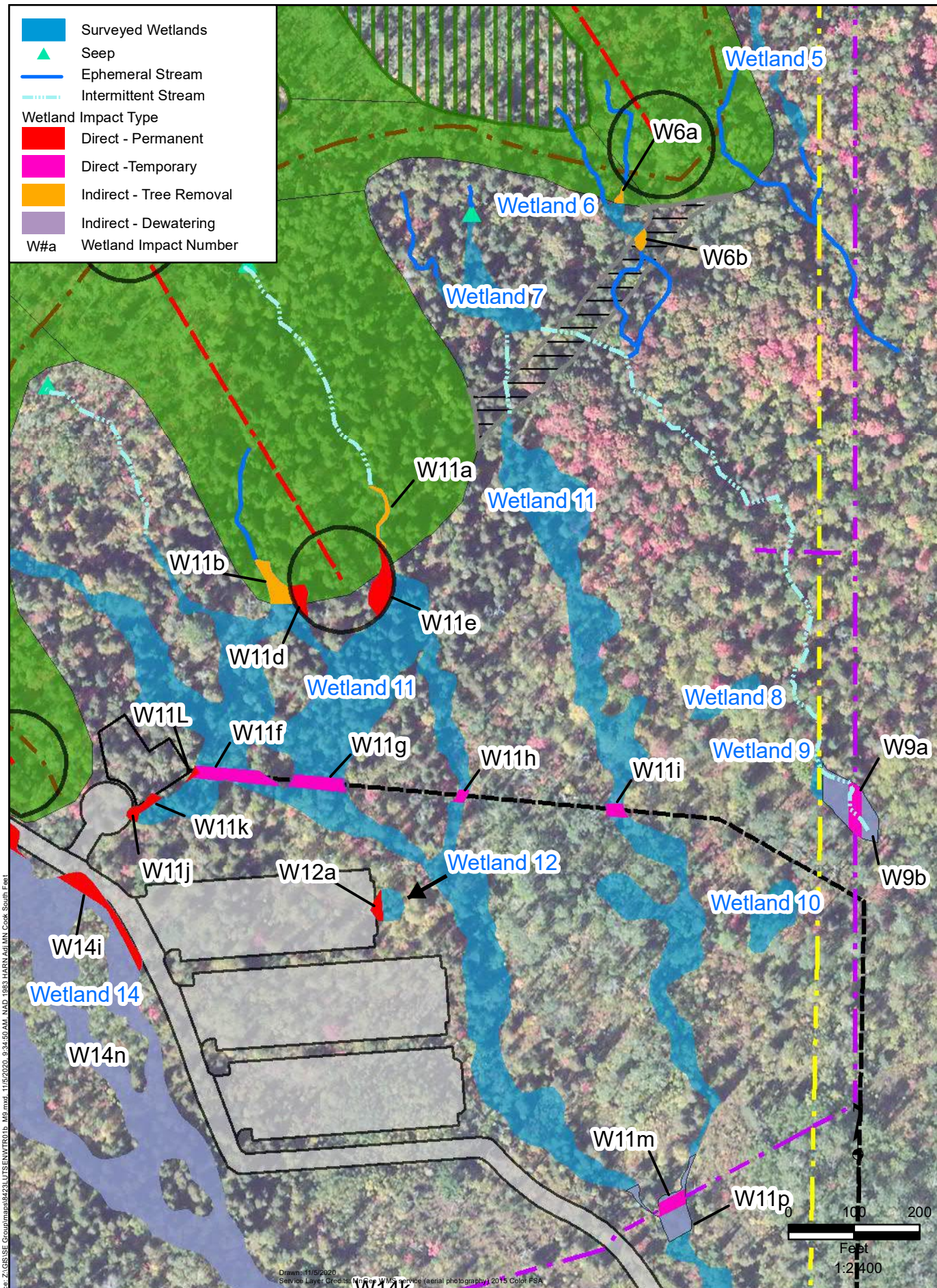
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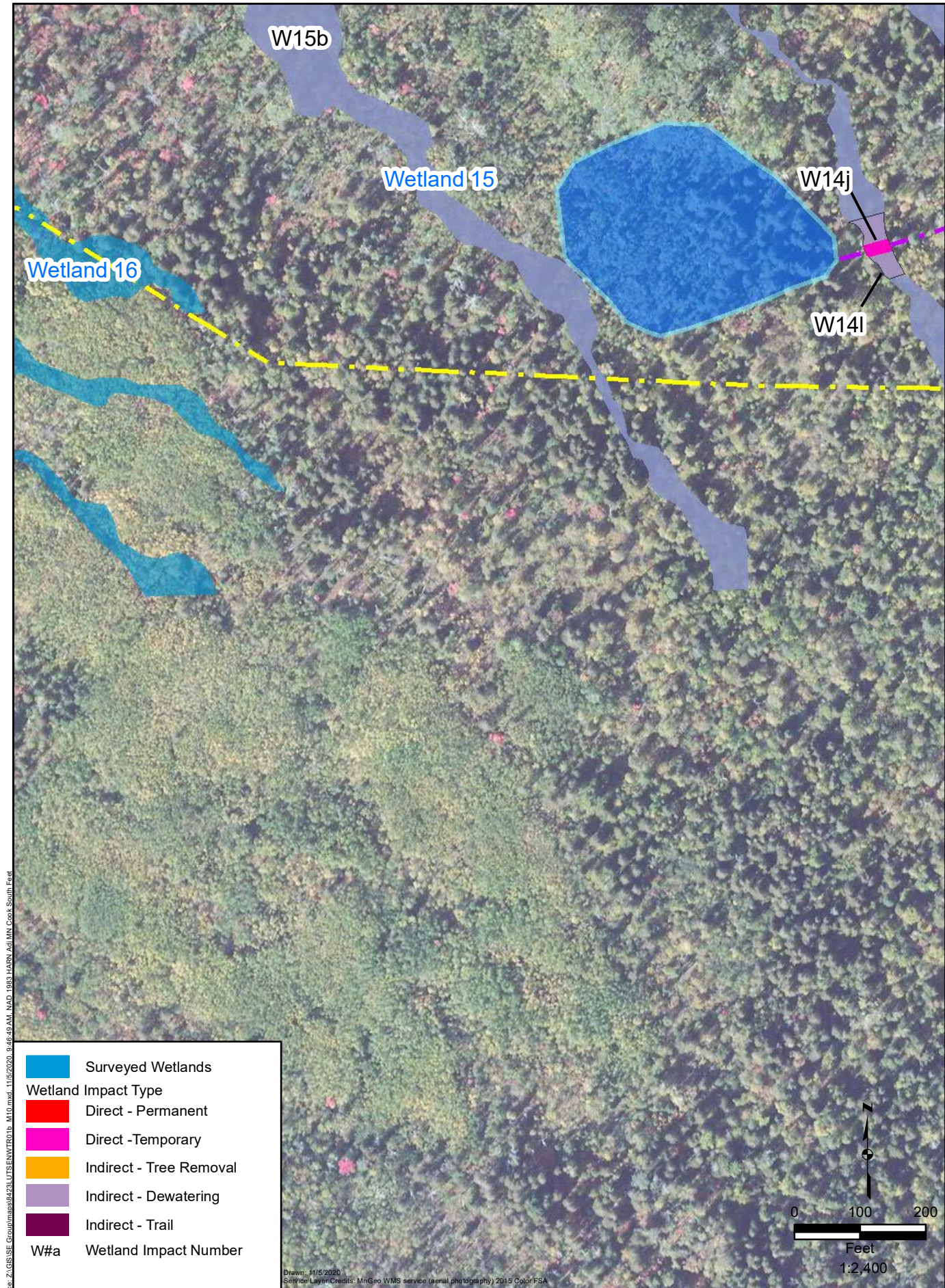
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WETLAND MAP - M8
 MOOSE MOUNTAIN SUP
 ALTERNATIVE 2 - PROPOSED ACTION



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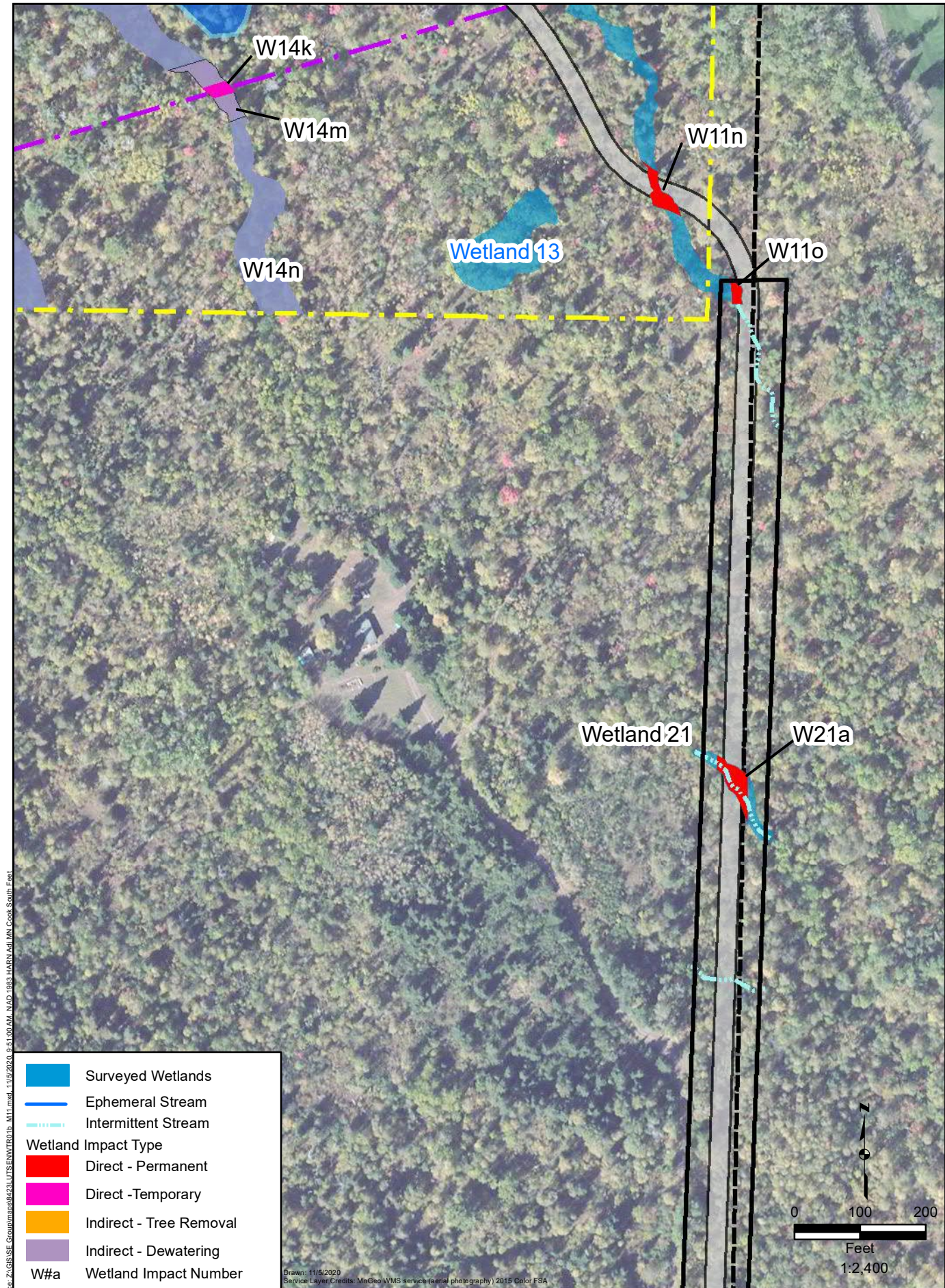


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WETLAND MAP - M10

MOOSE MOUNTAIN SUP
ALTERNATIVE 2 - PROPOSED ACTION



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WETLAND MAP - M11

MOOSE MOUNTAIN SUP
 ALTERNATIVE 2 - PROPOSED ACTION

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WETLAND MAP - M12

MOOSE MOUNTAIN SUP
ALTERNATIVE 2 - PROPOSED ACTION




APPENDIX

C

















EAGLE MOUNTAIN WETLAND
MAPS – ALTERNATIVE 2

Legend





GIS layers generated by SE GROUP

-  SUP Boundary
-  Private Boundary
-  Existing Superior Hiking Trail (SHT)




Proposed Projects

-  Mountain Access Roads
-  Lifts
-  SHT Realignments
-  Snowmobile Trail Realignment
-  Temporary Mtn Access Roads
-  Snowmaking Line
-  Power Line
-  Base Area Drainfields
-  Base Area Facilities
-  Base Area Roads and Parking
-  Glades
-  Lift Egress Tree Cutting
-  Ski Trails
-  Legacy Patches
-  Lift 7 Stormwater Pond
-  Snowmaking and Stormwater Ponds






GIS layers generated by WSP

-  Wetlands
-  Ephemeral Stream
-  Intermittent Stream
-  Seep

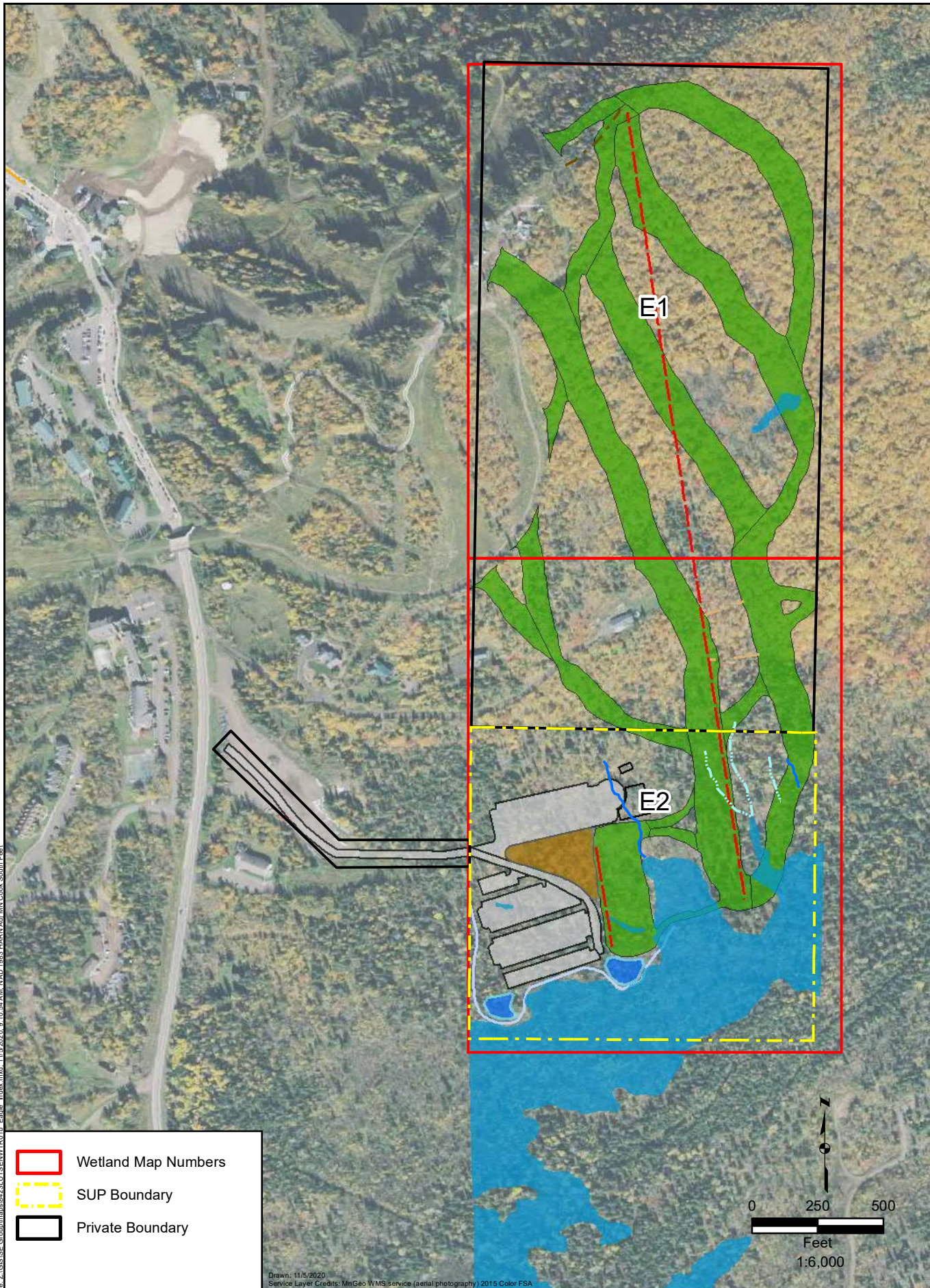
Stream Impact Type

-  Direct - Permanent
-  Direct - Temporary
-  Indirect - Tree Removal

Wetland Impact Type

-  Direct - Permanent
-  Direct - Temporary
-  Indirect - Trail
-  Indirect - Tree Removal
-  Indirect - Dewatering

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Drawn: 11/5/2020
Service Layer Credits: MnGeo WMS service (aerial photography) 2015 Color FSA



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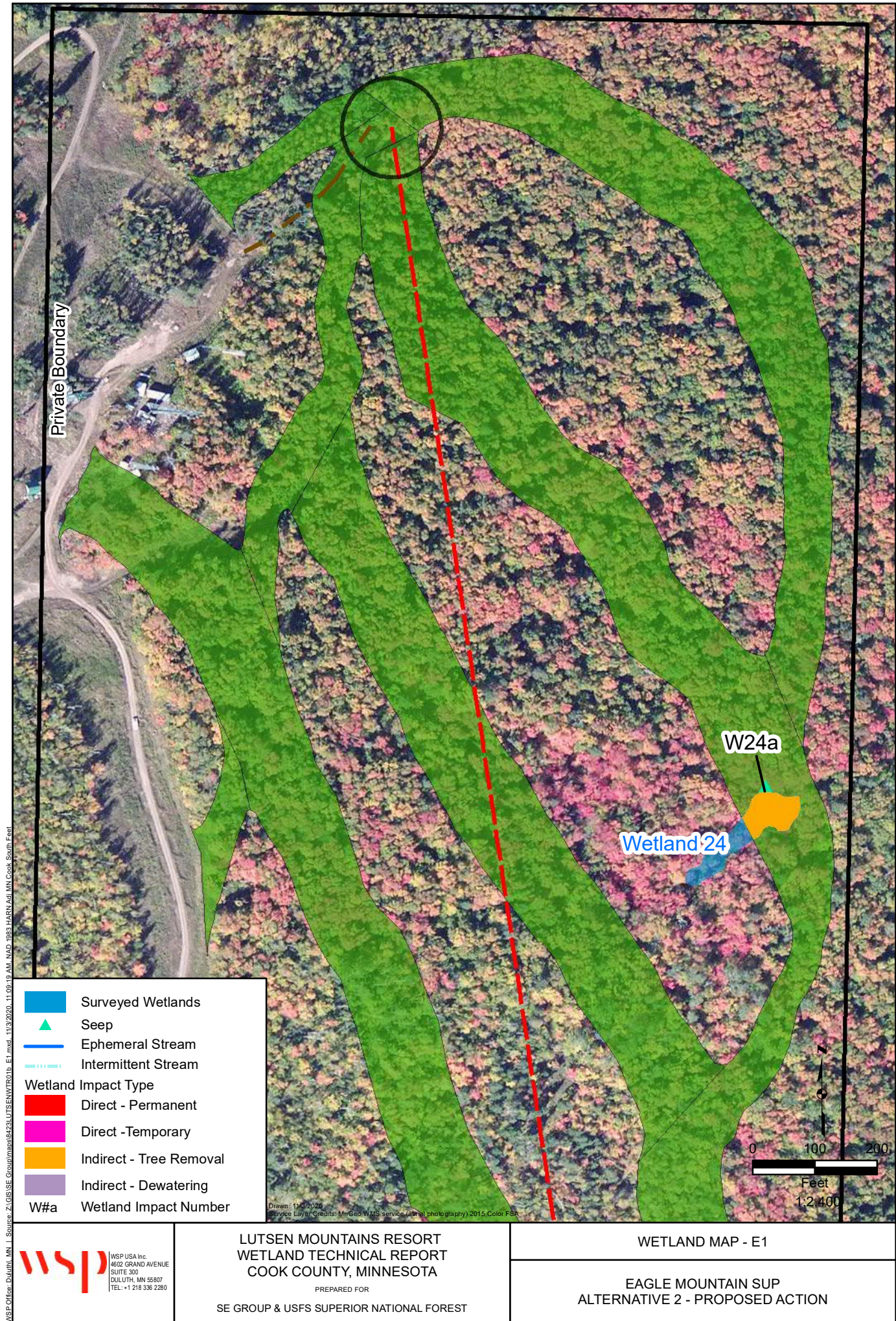
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WETLAND TECHNICAL REPORT
COOK COUNTY, MINNESOTA

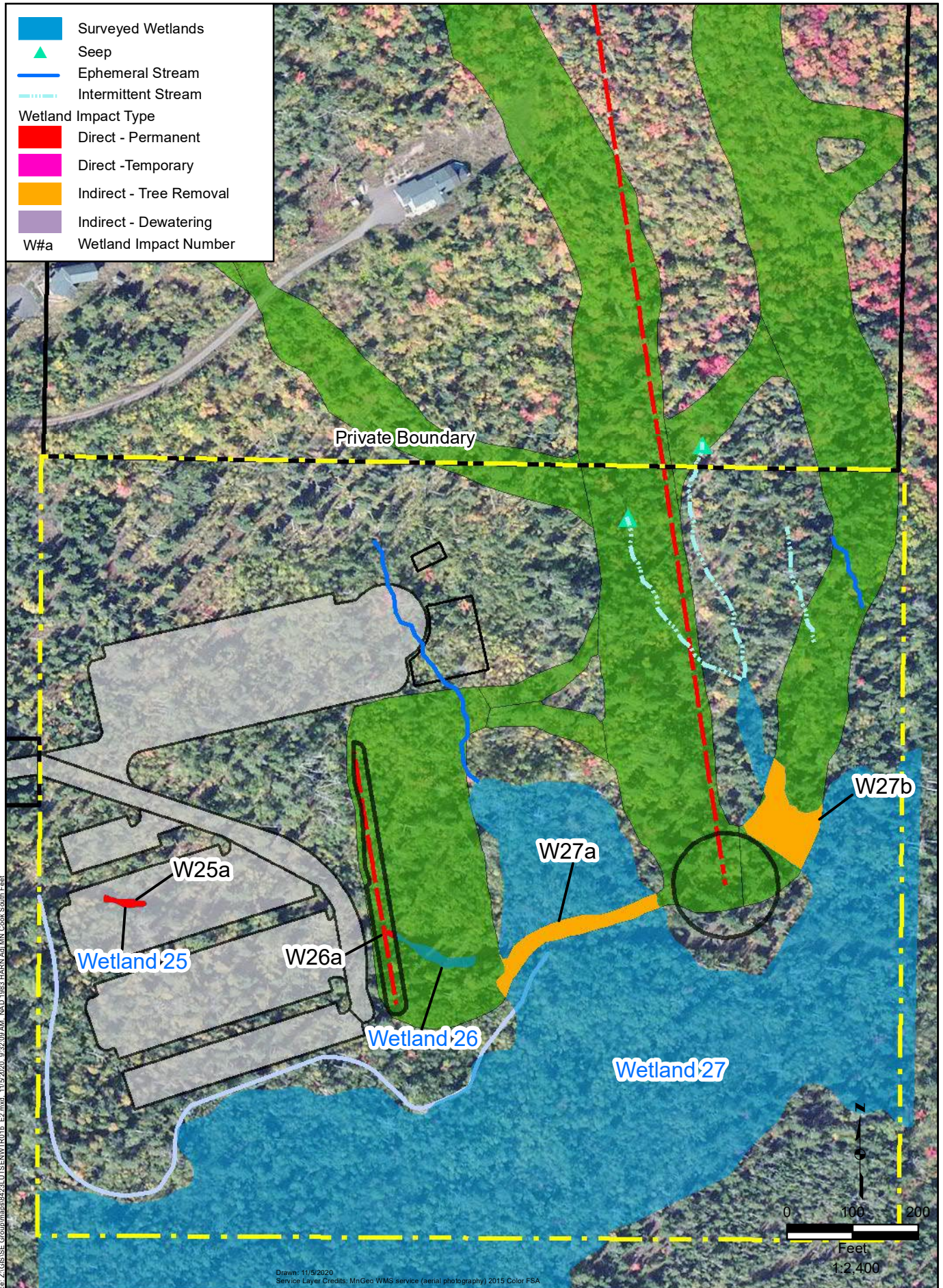
PREPARED FOR

SE GROUP & USFS SUPERIOR NATIONAL FOREST

WETLAND MAP INDEX

EAGLE MOUNTAIN SUP
ALTERNATIVE 2 - PROPOSED ACTION





WSP Office: Duluth, MN | Source: Z:\GIS\SE Group\mapdata\4231 LUTSEN\WTR01b_E2.mxd | 11/5/2020, 9:32:09 AM | NAD 1983 HARN ADI MN Cook South East



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LUTSEN MOUNTAINS RESORT
WETLAND TECHNICAL REPORT
COOK COUNTY, MINNESOTA

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WETLAND MAP - E2

EAGLE MOUNTAIN SUP
ALTERNATIVE 2 - PROPOSED ACTION




APPENDIX

D

















MOOSE MOUNTAIN WETLAND
MAPS – ALTERNATIVE 3

Legend





GIS layers generated by SE GROUP

-  SUP Boundary
-  Private Boundary
-  Existing Superior Hiking Trail (SHT)




Proposed Projects

-  Mountain Access Roads
-  Lifts
-  SHT Realignments
-  Snowmobile Trail Realignment
-  Temporary Mtn Access Roads
-  Snowmaking Line
-  Power Line
-  Base Area Drainfields
-  Base Area Facilities
-  Base Area Roads and Parking
-  Glades
-  Lift Egress Tree Cutting
-  Ski Trails
-  Legacy Patches
-  Lift 7 Stormwater Pond
-  Snowmaking and Stormwater Ponds






GIS layers generated by WSP

-  Wetlands
-  Ephemeral Stream
-  Intermittent Stream
-  Seep

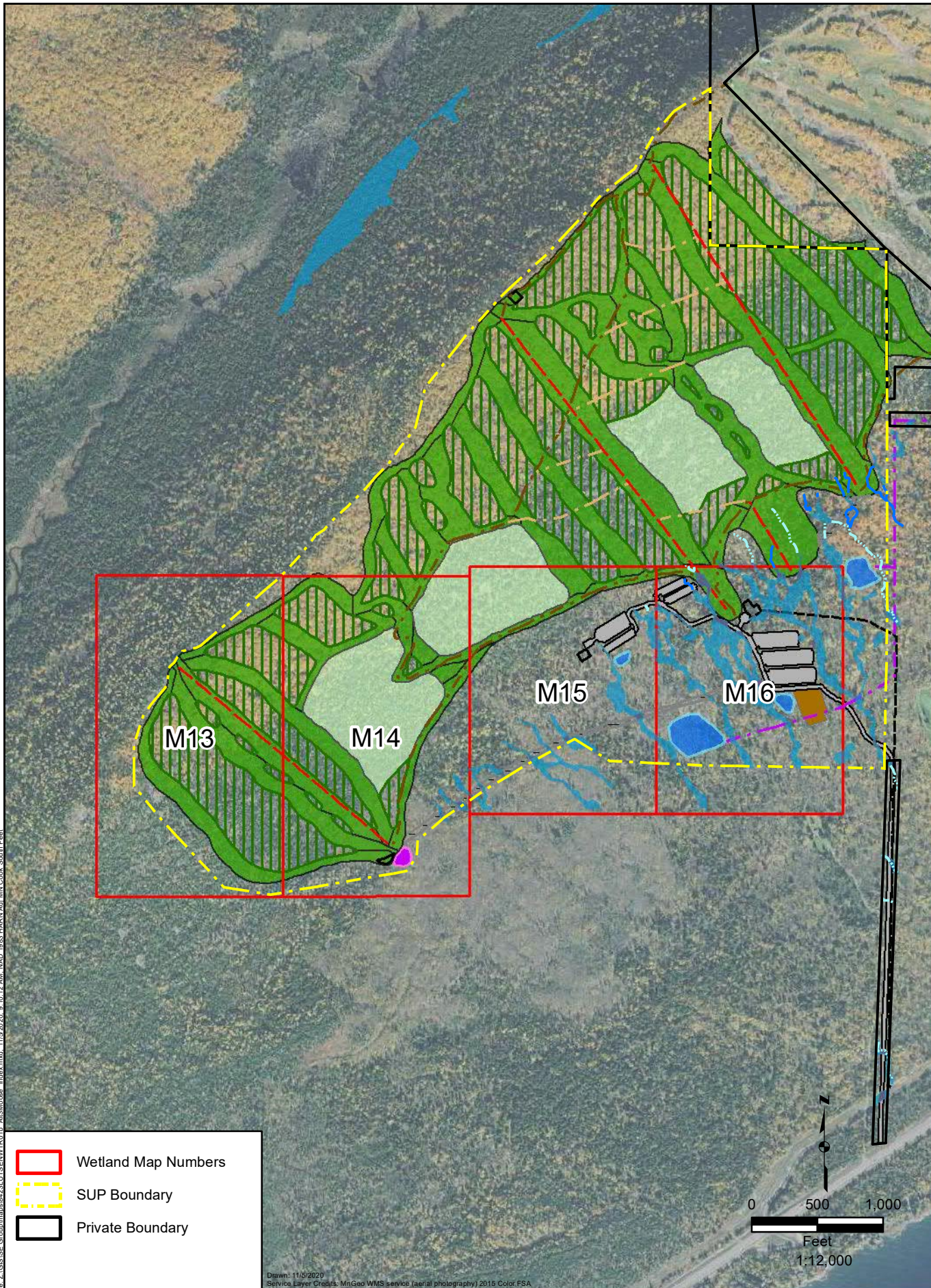
Stream Impact Type

-  Direct - Permanent
-  Direct - Temporary
-  Indirect - Tree Removal

Wetland Impact Type

-  Direct - Permanent
-  Direct - Temporary
-  Indirect - Trail
-  Indirect - Tree Removal
-  Indirect - Dewatering

WSP:Office: Duluth, MN | Source: Z:\GIS\SE_Group\mapas\4293\LUTSEN\WTR01b_Alt3\Moore_Index.mxd, 11/5/2020, 9:10:12 AM, NAD 1983 NADN AdJ MN Cook South East



Drawn: 11/5/2020
Service Layer Credits: MtnGeo WMS service (aerial photography) 2015 Color FSA





LUTSEN MOUNTAINS RESORT
WETLAND TECHNICAL REPORT
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WETLAND MAP INDEX

MOOSE MOUNTAIN SUP
ALTERNATIVE 3 - RESOURCE PROTECTION

WSP Office, Duluth, MN | Source: Z:\GIS\SE Group\mapdata\423\LUTSEN\WTR01b_M13.mxd, 11/5/2020, 9:36:17 AM, NAD 1983 HARN Adm MN Cook South Feet



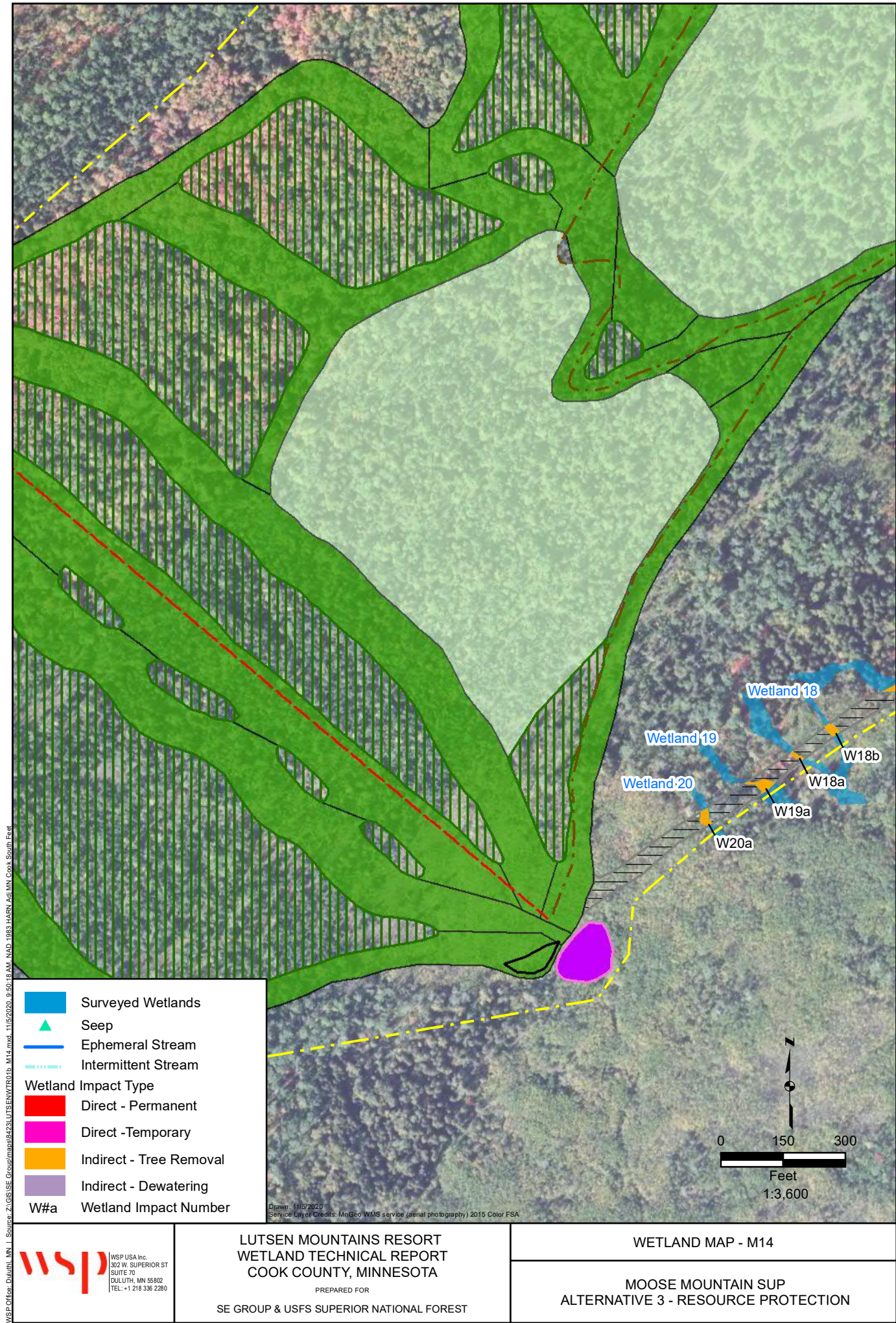
	Surveyed Wetlands
	Seep
	Ephemeral Stream
	Intermittent Stream
Wetland Impact Type	
	Direct - Permanent
	Direct - Temporary
	Indirect - Tree Removal
	Indirect - Dewatering
	Wetland Impact Number

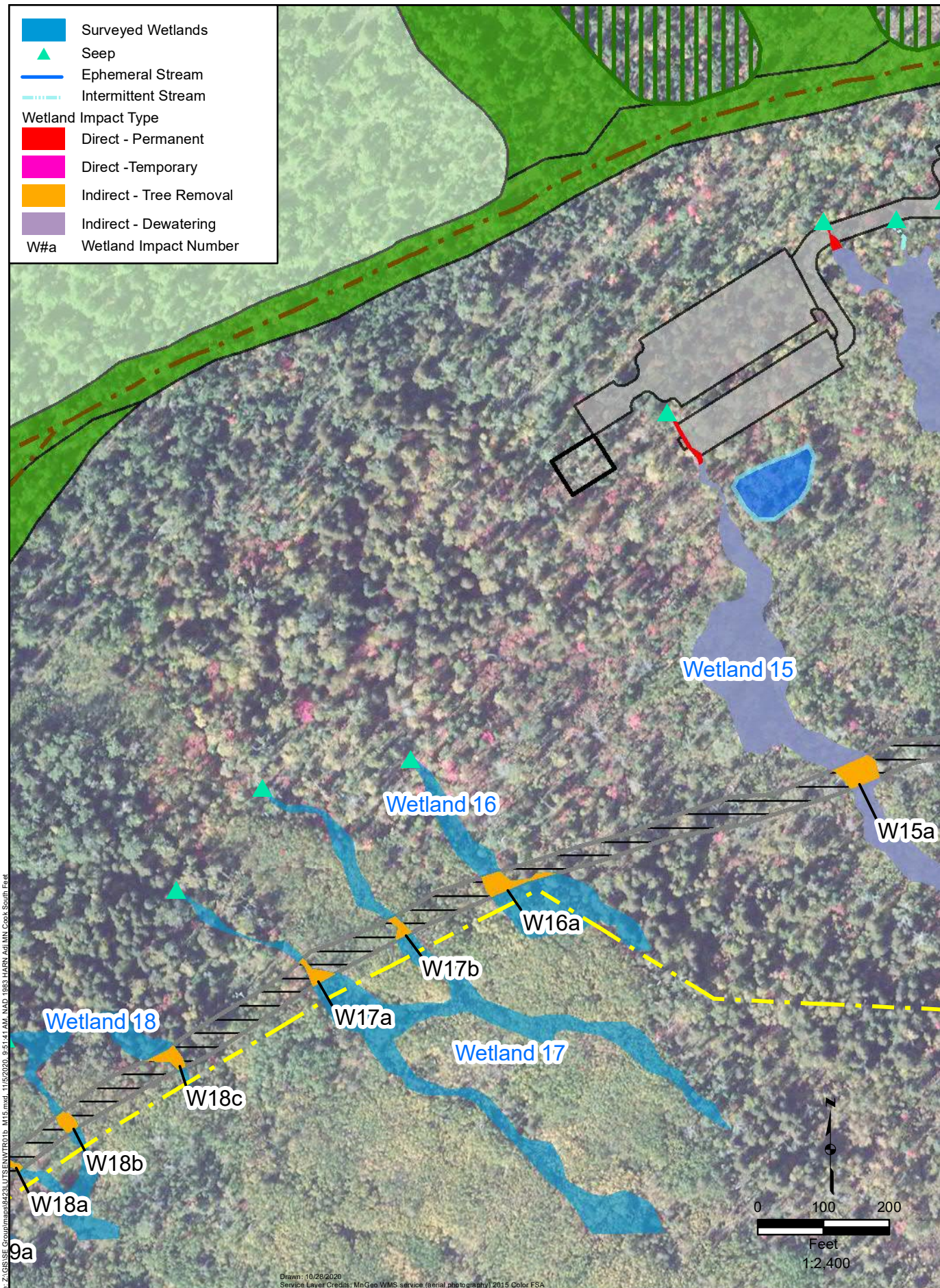
Drawn: 11/5/2020
Service Layer Credits: MnGeo WMS service (aerial photography) 2015 Color FSA

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WETLAND MAP - M13
MOOSE MOUNTAIN SUP ALTERNATIVE 3 - RESOURCE PROTECTION





WSP Office: Duluth, MN | Source: Z:\GIS\SE_Groundmap\8429\LUTSEN\WTR01b_M15.mxd, 11/5/2020, 9:51:41 AM, NAD 1983 HARN AdM, MN Cook South Feet



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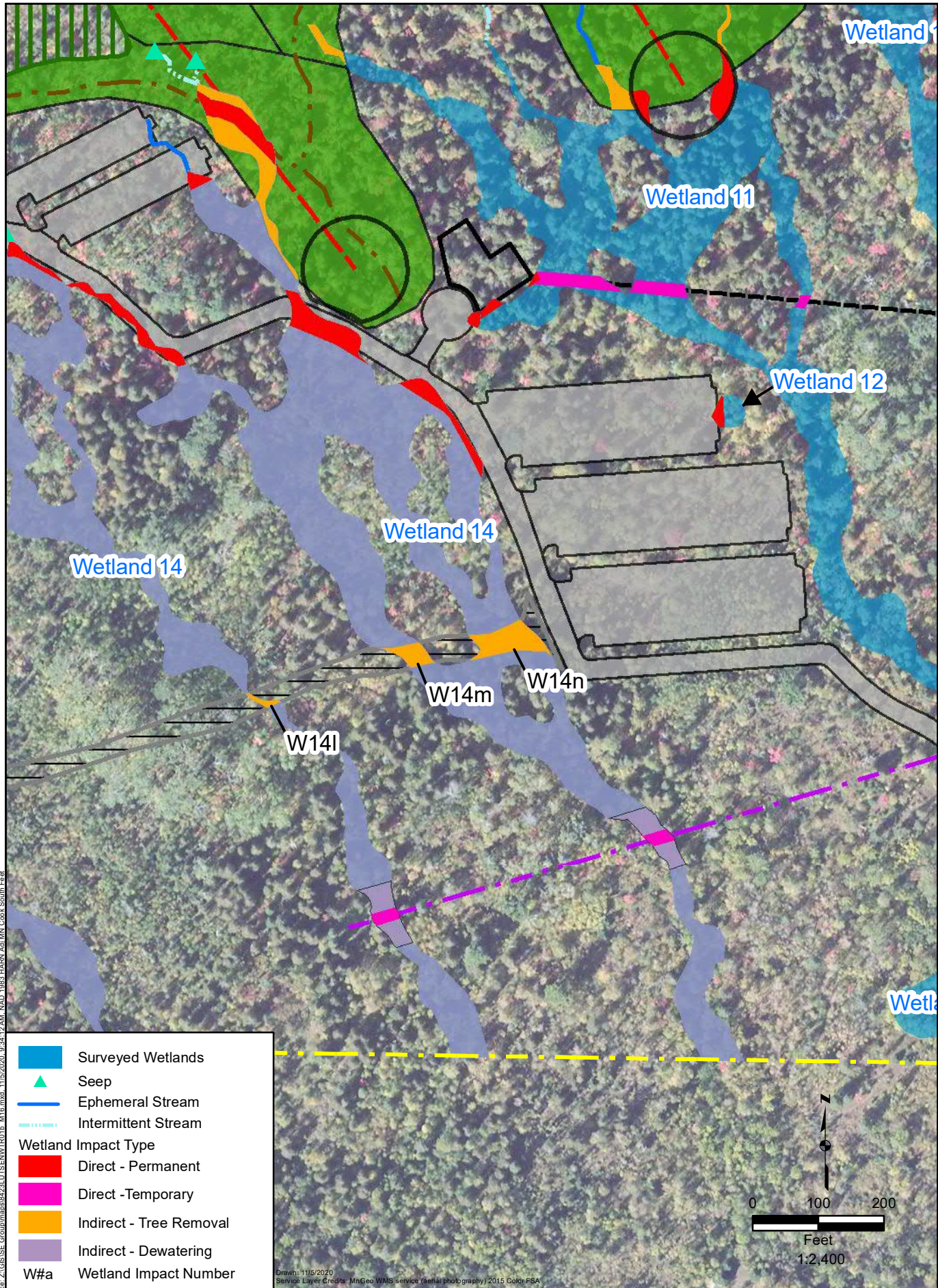
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WETLAND MAP - M15

MOOSE MOUNTAIN SUP
ALTERNATIVE 3 - RESOURCE PROTECTION



WSP Office: Duluth, MN. Source: Z:\GIS\SE_Group\mapdata\4231\LUTSEN\WTR01b_M16.mxd, 11/5/2020, 9:34:12 AM. NAD 1983 HARN AdM, MN Cook South Feet



LUTSEN MOUNTAINS RESORT
WETLAND TECHNICAL REPORT
COOK COUNTY, MINNESOTA

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WETLAND MAP - M16




MOOSE MOUNTAIN SUP
ALTERNATIVE 3 - RESOURCE PROTECTION

APPENDIX

















E MOOSE MOUNTAIN STREAM MAPS – ALTERNATIVE 2 AND ALTERNATIVE 3

Legend





GIS layers generated by SE GROUP

-  SUP Boundary
-  Private Boundary
-  Existing Superior Hiking Trail (SHT)




Proposed Projects

-  Mountain Access Roads
-  Lifts
-  SHT Realignment
-  Snowmobile Trail Realignment
-  Temporary Mtn Access Roads
-  Snowmaking Line
-  Power Line
-  Base Area Drainfields
-  Base Area Facilities
-  Base Area Roads and Parking
-  Glades
-  Lift Egress Tree Cutting
-  Ski Trails
-  Legacy Patches
-  Lift 7 Stormwater Pond
-  Snowmaking and Stormwater Ponds






GIS layers generated by WSP

-  Wetlands
-  Ephemeral Stream
-  Intermittent Stream
-  Seep

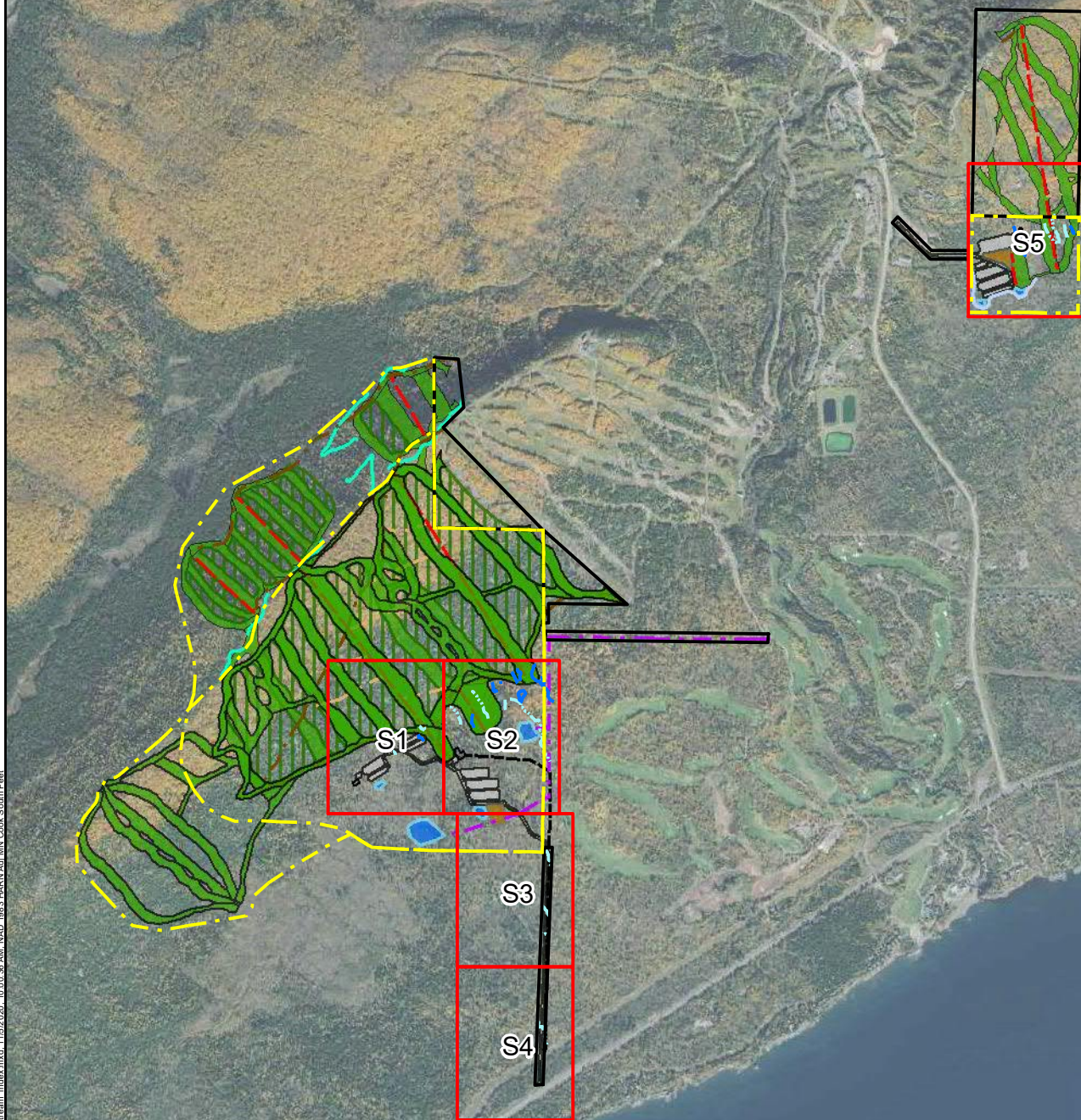
Stream Impact Type




-  Direct - Permanent
-  Direct - Temporary
-  Indirect - Tree Removal

Wetland Impact Type

-  Direct - Permanent
-  Direct - Temporary
-  Indirect - Trail
-  Indirect - Tree Removal
-  Indirect - Dewatering

WSP Office, Duluth, MN | Source: Z:\GIS\SE Group\mapdata\4231\LUTSEN\WTR01b.Mxd Stream Index.mxd, 11/5/2020, 10:00:38 AM, MAD_1083_HARP_Azi, MN Cook, South East



-  Wetland Map Numbers
-  SUP Boundary
-  Private Boundary

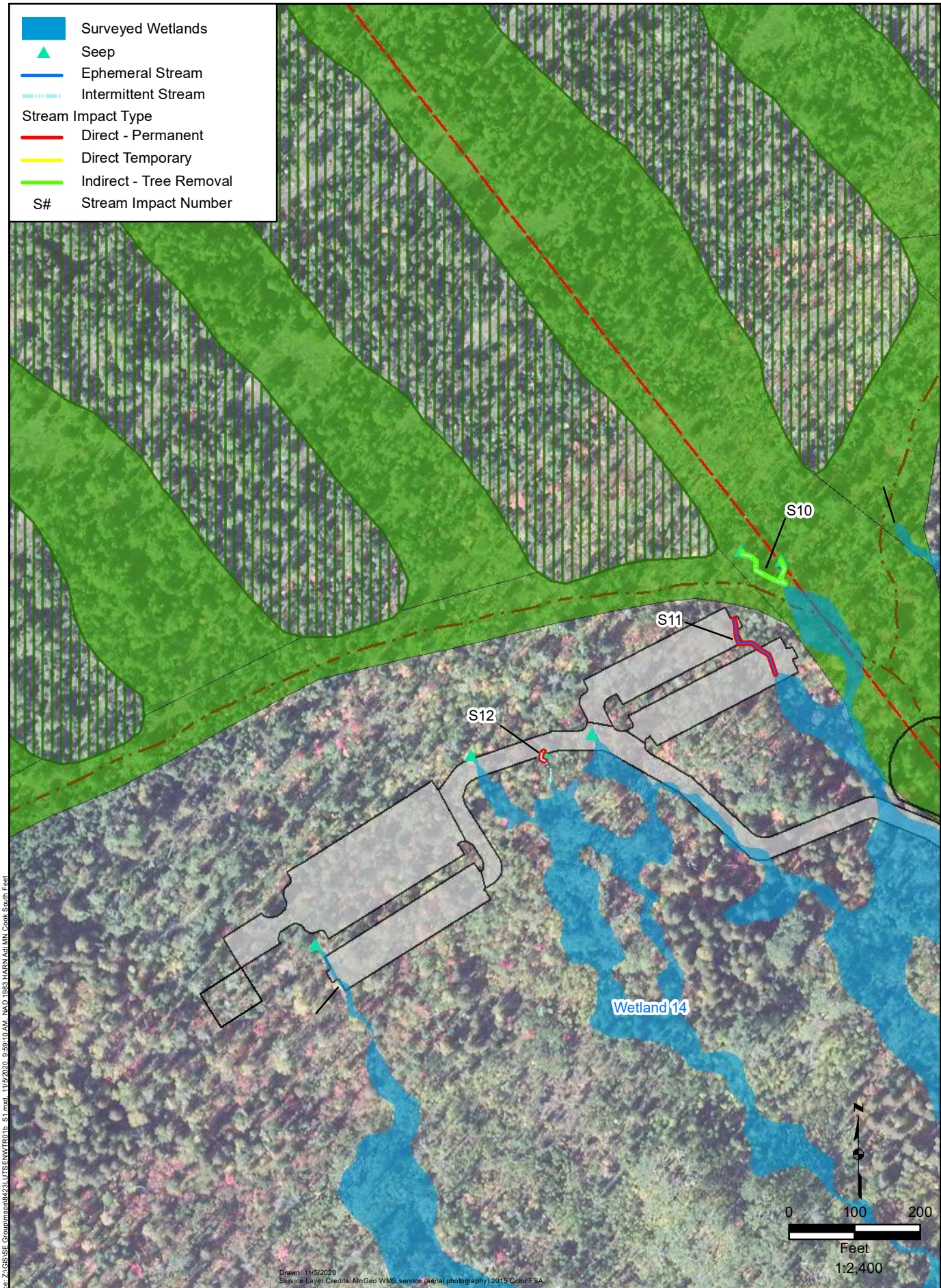
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Service Layer Credits: MnGeo WMS service (aerial photography) 2015 Color FSA



LUTSEN MOUNTAINS RESORT
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STREAM MAP INDEX

MOOSE & EAGLE MOUNTAIN SUP
ALTERNATIVE 2 & ALTERNATIVE 3



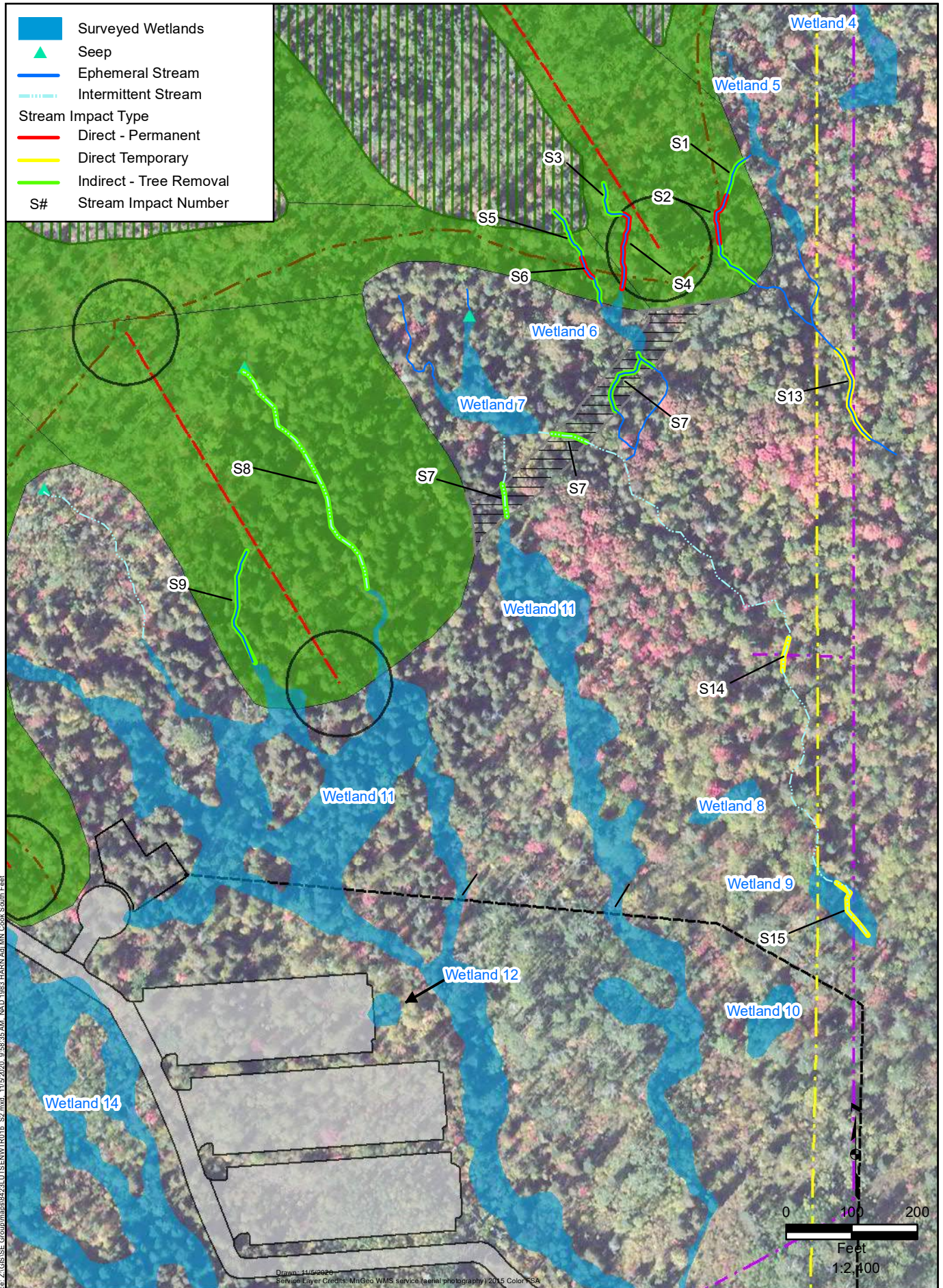
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STREAM MAP - S1
 MOOSE MOUNTAIN SUP
 ALTERNATIVE 2 & ALTERNATIVE 3



WSP Office: Duluth, MN | Source: Z:\GIS\SE_Group\mapas\4231\LUTSEN\WTR01b_S2.mxd | 11/5/2020, 9:58:35 AM | NAD 1983 HARN Ad. MN Cook South Feet



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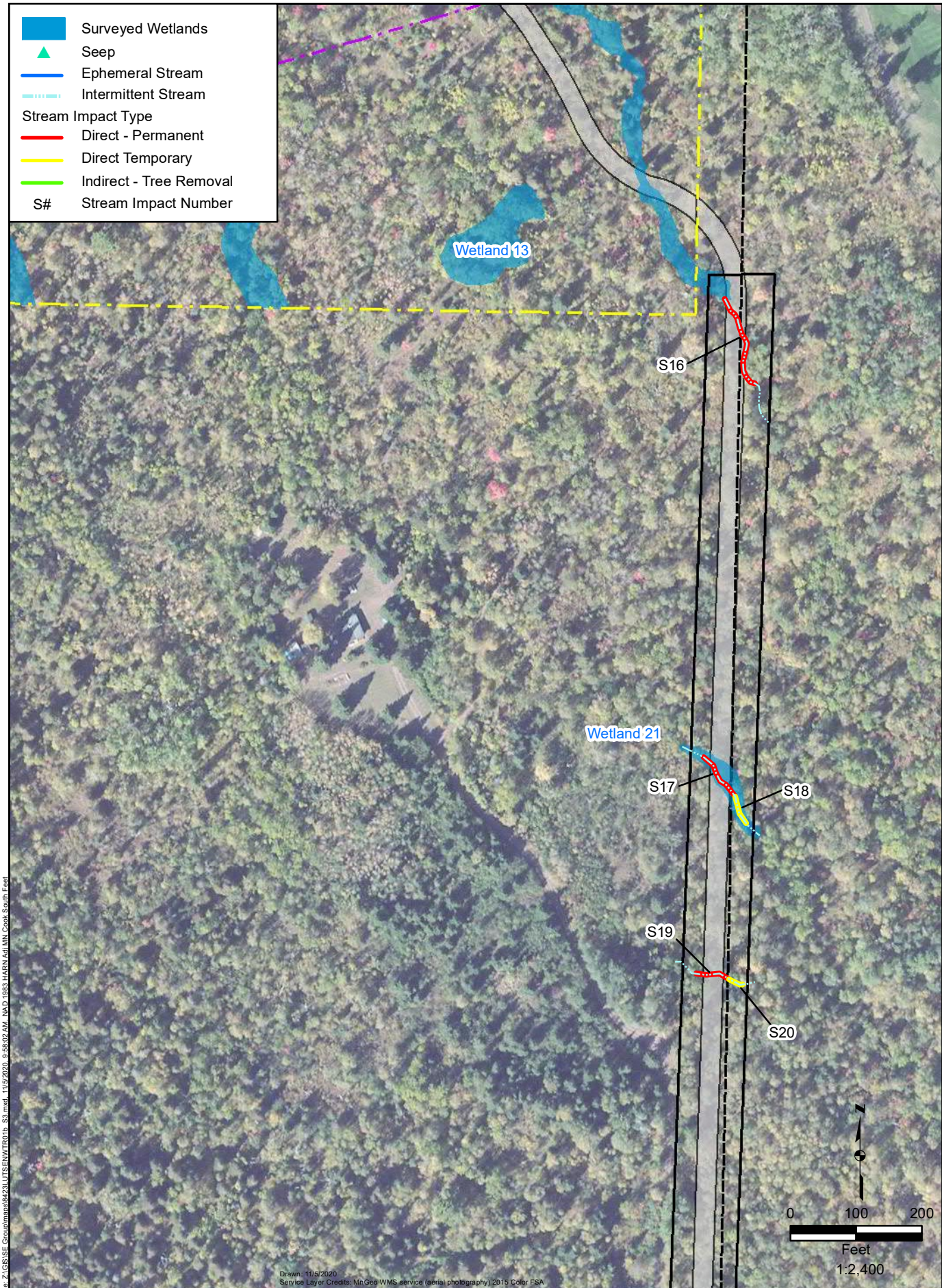
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STREAM MAP - S2

MOOSE MOUNTAIN SUP
 ALTERNATIVE 2 & ALTERNATIVE 3



WSP Office: Duluth, MN | Source: Z:\GIS\SE_Group\maps\14231\LUTSEN\WTR01b_S3.mxd, 11/5/2020, 9:58:02 AM, NAD 1983 HARN Adj. MN Coast, South Feet



**LUTSEN MOUNTAINS RESORT
WETLAND TECHNICAL REPORT
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STREAM MAP - S3

**MOOSE MOUNTAIN SUP
ALTERNATIVE 2 & ALTERNATIVE 3**



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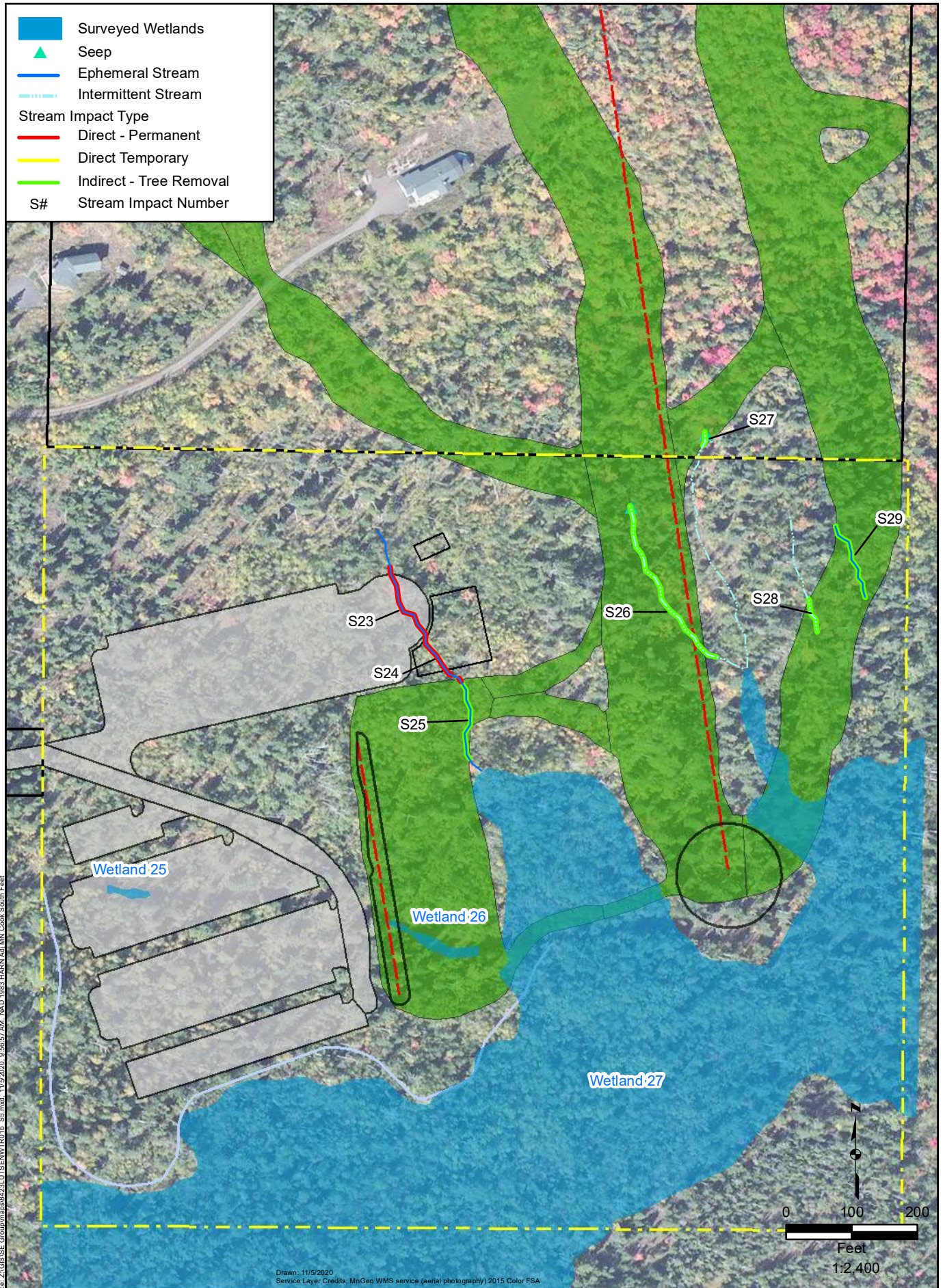
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LUTSEN MOUNTAINS RESORT
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STREAM MAP - S4

MOOSE MOUNTAIN SUP
ALTERNATIVE 2 & ALTERNATIVE 3



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 <p>WSP USA Inc. 4602 GRAND AVENUE SUITE 300 DULUTH, MN 55807 TEL: +1 218 336 2280</p>	<p>LUTSEN MOUNTAINS RESORT WETLAND TECHNICAL REPORT COOK COUNTY, MINNESOTA</p> <p>PREPARED FOR</p> <p>SE GROUP & USFS SUPERIOR NATIONAL FOREST</p>	<p>STREAM MAP - S5</p>
		<p>EAGLE MOUNTAIN SUP ALTERNATIVE 2 & ALTERNATIVE 3</p>